The Apple:

ITS HISTORY, VARIETIES, AND CULTIVATION.

ILLUSTRATED.

By D. T. FISH

(Author of "Pruning, Grafting, and Budding Fruit Trees," "Bulbs and Bulb Culture," "Budding Roses," &c.)

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Then in growing apples for profit, selection, not collection, should be kept strictly in view. Find out by observation or experience what sorts thrive best and sell for most money in any given locality, and grow chiefly these. Those who grow apples chiefly for their own pleasure or amusement, or merely to supply their own tables with apples from the July of one year to the August, or later, of the next—thus making not only the new and the old crop meet, but overlap by several months—will, of course, grow a considerable collection, and choose several of no great merit, beyond their being in season at some particular time. But the commercial grower finds it to his interest to confine himself to a comparatively few sorts, and to be specially chary of bad keepers. Even in private establishments the fashion has set in strongly in favour of selecting the best only, and growing a half dozen or a dozen of trees of one sort, instead of as many different varieties. Where apples used to be grown by varieties in fifties and hundreds we often find them now by only dozens or scores. The reduction has been effected by a system of rigorous selection, which has left only the best for that locality or district.

It, however, by no means follows that the best for Kent or Devonshire are also the best for Lancashire or Durham, and hence the importance of a large variety to choose from, and also of hybridisers and horticulturists growing and raising new varieties specially suited for different localities. This, in fact, will be the next great advance in apple culture, and the probability is that, before many more years have elapsed, each county or group of counties will have its apples classified and named, and as generally recognised as belonging to it or them as the native floras of different districts are known and correctly described now.

VARIETIES.

HAVING written so much about the importance of selection, we now proceed to give brief descriptive lists of some of the best and most generally serviceable varieties of dessert and kitchen apples that do well over the greater part of England. In regard to this division of apples into two classes, it must be admitted that it is somewhat arbitrary, for the Orange, Ribston, and Golden among the Pippins, Reinette du Canada, and others, are among the finest of all apples for cooking;

while Bess Pool, Blenheim Pippin, Cellini, Alfriston, and many others, generally reckoned among kitchen apples, are often much relished for dessert. So diversified are tastes in these matters that we have known the Nonsuch preferred for eating to most of the dessert varieties. Still, though the two classes may overlap, as it were, and many in each are almost equally good for either purpose, yet there are some capital kitchen apples, such as the Beefings and the Yorkshire Greening, that no one can eat uncooked. The converse, however, does not hold good, and in general terms it may almost be affirmed that for most purposes the better the apples to eat raw the better also when cooked, and the less sugar will be required. It is forgetfulness of the latter fact that has rendered dessert apples unpopular for cooking purposes. The tarts, &c., have been rendered insipid by being sugared twice, once and sufficiently by nature, and again by art. On the contrary, such fine dessert apples as the Ribston, Blenheim, Sturmer, Wormsley, and King of the Pippins, most of the Pearmains, Reinette du Canada, Golden Reinette, Dutch Mignonne, and Boston, and other Russets, have sugar enough, or in excess, for all culinary purposes without any addition; and by the use of these and other dessert fruit for cooking the expense of sugar is saved and the flavour of the apples is far superior. For even the flavour of many of the kitchen apples is lowered, and not unfrequently utterly ruined, by the amount of inferior raw sugar employed to give them the required sweetness. It is cheaper as well as better to grow sugar sufficient in superior varieties of fruit than to purchase it from the grocer.

It must, however, be admitted that dessert fruits are not equal for sauce to such well-known sorts as the Keswick Codlin, Alexander, Hawthornden, Lord Suffield, Cellini, Beauty of Kent, Nonsuch, or, best of all, perhaps—where it is warm enough for it, or where a portion of south or west wall or orchard house could be given up to its cultivation—the Calville Blanche. This is as white as cream, and when cooked and whipped with it almost equals it in appearance and flavour.

I.—Dessert Apples.

The following are twelve good dessert apples for general use, ripening throughout the season:

Red Astrachan.—Delicate and richly-flavoured, bright and showy fruit, of good size; one of the most useful of early apples. In season August to September.

Kerry Pippin.—An excellent early apple, of brisk flavour and bright golden colour. September to October.

King of the Pippins.—An excellent bearer, good medium-sized showy apple, of a brisk flavour. October to January.

Cox's Orange Pippin.—One of the finest and handsomest of all dessert apples. October to January.

Ribston Pippin.—A universal favourite, in season from October to May, perhaps unprecedented in this latter respect, as well as unrivalled for excellence. The tree, however, is more given to canker than many other sorts. October to May.

Claygate Pearmain.—Has most of the best qualities of the Ribston Pippin, but grows and thrives better in most localities. November to March.

Cockle Pippin. — Medium sized, richly flavoured, capital bearer. January to April.

Old Golden Pippin.—This is such a general favourite that it ought to have a place in a first dozen. It is not only of excellent quality, but has a sort of semi-classical reputation, which renders it always welcome at the dessert. The tree and its produce, which never seemed more plentiful than now, are also a vigorous protest against the theory of the wearing out of species or varieties. December to March.

Reinette du Canada.—A large handsome apple, varying in colour from green to bright red, and lasting in season from November to April, very useful and good. November to May.

Northern Spy.—Highly aromatic, large, and tender. December to May.

Scarlet Nonpareil.—Highy-flavoured, showy fruit, one of the most attractive and useful of all the rich-flavoured family of Nonpareil. January to March.

Sturmer Pippin.—A brisk and richly-flavoured medium-sized dessert fruit, lasting in season from February to June.

Those who have room for twenty-four varieties may add the following twelve :

Early Margaret.—A fine-flavoured, white-fleshed variety, full of juice and flavour, but soon gets mealy ; so best eaten off the tree. August.

Red Quarrendon.—Under medium size, bright scarlet, crisp and sweet, one of the best of all summer apples, and the most beautiful on the table. August.

Irish Peach.—A very distinct and beautiful dessert apple, perhaps better known as the Early Crofton. The colour is yellowish green, the flesh white, full of juice and high-flavoured. August.

Pine Apple Russet.—A very fine-flavoured, highly-perfumed, yellow fleshed apple. September to October.

Golden Reinette.—Fruit rather small, colour yellowish red streaked

with red, and quality of the highest, one of the very best and most useful dessert apples. October to January.

Sam Young.—Very highly flavoured, tender, and juicy; colour yellowish, with russet spots. November to February.

Boston Russet.—Resembling somewhat in general character, and also in flavour, the Ribston Pippin. January to April.

Duke of Devonshire. — Crisp, juicy, high-flavoured, medium size. February to May.

Pearson's Plate.—Rather small, but handsome, excellent dessert apple. December to March.

Keddlestone Pippin.—Beautiful yellow or golden colour, specked with russet, flesh juicy and highly aromatic. A general favourite.

Allen's Everlasting.—A good deal like the Sturmer Pippin, and an equally useful and excellent variety; one of the best late dessert apples. May and June.

Lord Burghley.—A first-rate dessert apple; fruit medium-sized, golden yellow. In season from December to May.

Those who have space for three dozen of dessert apples may add the following:

Cornish Aromatic. — Medium size, rich, juicy, and excellent. In season December.

Mother Apple.—Rather tender, juicy, melting, and rich. October to November.

Ingestrie Red.—Very pretty bright red next the sun on a yellow ground, the flesh pale yellow, the flavour brisk and sparkling, like the Golden Pippin in quality.

Ingestrie Yellow or Golden.—This is also a first-rate dessert apple, and is in season from the beginning of September to the end of November.

Court Pendu Plat.—Flesh yellow, flavour somewhat acid, a most useful late apple. In season from November to April.

Dredge's Fame.—A good-sized handsome dessert apple, greenish silver in colour, mottled with pale red next the sun; flavour highly aromatic, rich, and sugary. In season from December to March, and good for cooking as well as dessert.

Lamb Abbey Pearmain.—A fine medium-sized apple; flesh yellowish green, crisp, juicy, and sweet. In season from December to April; one of the most useful late dessert apples.

Early Nonpareil.—A most useful dessert apple, with all the good qualities of the Nonpareil. October to December.

Winter Strawberry.—This is a most useful dessert apple of a pleasing colour, yellow striped with red, of medium size, and a most pleasant brisk aromatic flavour. In season from November to March.

The Summer Strawberry.—Ripens in September, and is a showy, rather small apple, striped yellow and red, with a brisk and pleasant flavour.

Stamford Pippin.—A good-sized apple of a yellow and orange colour, with a sweet pleasant flavour, a first-rate dessert apple, in season from December to March, and also one of the finest apples for choice pies and puddings.

Small's Admirable.—Above medium size, of a bright yellow colour, flesh yellow, sweet, with a dash of acid that gives it a pleasing relish; one of the finest dessert apples, also admirable for cooking through the winter months of November and December.

In the case of dessert apples a greater variety may be desirable, and we shall therefore briefly describe another two dozen good dessert apples, swelling our list to sixty sorts. No doubt beyond this there are many other apples almost equally worth growing. But we hope at least that those who select from or grow these sixty will not be disappointed.

Early Julien.—A pretty medium-sized excellent early variety. Flesh, crisp and juicy, yellowish, white with a brisk aromatic flavour. August.

Dutch Mignonne.—Fruit rather large, handsome orange colour; one of the finest and most prolific varieties. December to April.

Golden Harvey or Brandy Apple.—Fruit small russety, flesh compact, firm, rich, and highly aromatic. This is a valuable little apple for dessert, and also for stewing in syrup, to be served as a sweet. The solidity of its flesh enables it to keep its form when treated in this way.

Braddick's Nonpareil.—Medium-sized, green ground colour, brownish next the sun, yellow flesh, rich and sweet. December to March.

Holbert's Victoria.—A small fruit of excellent quality; flesh yellow, juicy, rich, and vinous. December and May.

Joanneting or White Juneating.—The earliest of all dessert apples, coming in at the end of August; is generally liked for its crisp and pleasant flavour. It should, however, be eaten off the tree, as it soon becomes mealy when gathered.

Melon Apple.—A fine large fruit, with soft, juicy, and rich flesh. February.

Sykehouse Russet.—A very useful apple. The flesh is richly flavoured, of a greenish yellow colour. In season from December to January.

Golden Nonpareil.—Rather smaller than the old Nonpareil; flesh fine, rich, and sugary, and of the highest flavour.

Lodgemore Nonpareil.—Medium size; deep yellow, with a blush of red on one side; flavour rich; flesh juicy, crisp, and firm; one of the finest as well as latest of its class. February to June.

Tunstall Green-street.—Medium size, deep golden in colour, red striped where exposed to the sun, flesh firm, juicy and rich, the flavour resembling

the Ribston Pippin. An excellent dessert apple, continuing in season till the end of May.

Spring Ribston Pippin.—One of the finest late apples, keeping good till June.

Bull's Golden Reinette.—Resembling the Blenheim Pippin, but more highly coloured, and therefore a most handsome dessert apple of the highest flavour. December and January.

Golden Winter Pearmain.—Medium size, rich yellow ground colour, streaked with red next the sun, yellowish coloured flesh, juicy, aromatic, and sweet. October to January.

Worcester Pearmain.—New, brilliant scarlet, flesh tender, juicy, and sweet; one of the handsomest and most useful, either for dessert or kitchen use. Said to bear as freely as Lord Suffield. In season from August to Christmas.

Gooseberry Pippin.—Small, pale yellow, changing into orange when exposed to the light, very sweet, with a peculiarly rich vinous flavour; one of the richest apples in cultivation. November to February.

Packhorse.—Rather small, yellowish in colour, the flesh being of the same colour as the outside; juicy, rich, and sweet. November to March.

Scarlet Crofton.—Yellow and red, medium size, crisp, juicy, and sweet. October to December.

King George, or Borsdoffer.—A highly popular German apple of high quality; a sure cropper, the tree being at once hardy and a late flowerer. November to January.

Claygate Pearmain..—A first-rate dessert apple. In season from November to March. Found wild in a hedge in Surrey.

Court of Wick.—This is a fine apple, somewhat resembling the Golden Pippin in quality and appearance. October to March.

There is another and superior variety of this apple, called Morris's Court of Wick, which has much more colour than the original, and is likewise superior in quality.

Summer Golden Pippin.—An early variety of a well-known favourite, ripening in August.

Wormsley Pippin.—Large pale green, of excellent quality, either for dessert or kitchen use; one of the finest apples in cultivation. September to October.

Winter Quoining (or Queening).—A very bright coloured, almost red apple, flesh greenish yellow, a colour almost always associated with high flavour. In season from November to May. One of the most useful late apples, either for dessert or culinary purposes.

II.—Kitchen Apples.

The following twelve kitchen apples are arranged in order of time for use :

Lord Suffield.—Very large, white, soft, excellent for sauce and tarts, being of superior flavour. August to September.

Alexander.—Very large and showy ; a good apple if used before it gets sleepy. September to December.

Cox's Pomona.—Very superior large apple, of excellent quality. October.

Cellini.—Perfect in form, size, colour, quality; no better kitchen apple from October to January.

Mere de Menage.—Large and good. October to March.

Blenheim Orange or Pippin.—One of the finest and most useful of all kitchen apples. November to February.

Bess Pool.—A first-rate late-cooking apple, lasting from December to April.

Dumelow's Seedling or Wellington.—Firm, large, and somewhat acid, one of the most valuable kitchen apples. November to March.

Warner's King.—Large, handsome, and good. November to March.

Alfriston.—Very fine, large, white-fleshed apple, lasting in season from November to April.

Norfolk Beefing.—Large and good flavoured, excellent keeper, and most useful for baking whole and preserving. November to July.

Norfolk Greening.—Medium size, good flavour, rather acid, keeps till April or May.

Those who desire to have a longer list can add the following dozen :

New Hawthornden.—Very large, extraordinary bearer, and excellent for sauce and cooking. December and January.

Duchess of Oldenburgh.—A very handsome red striped apple, of excellent cooking properties. September.

Nonsuch.—Fine, sparkling, juicy apple, unequalled for sauce and cooking, and much liked by many for eating off the tree when quite ripe. September and October.

Manks Codlin.—One of the finest and most useful of all kitchen apples.

Golden Noble.—Large, handsome, and good. September to November.

Betty Geeson.—Large, valuable culinary apple. December to March.

Bedfordshire Foundling.—One of the finest and most useful kitchen apples, continuing in season from November to March.

Brabant Bellefleur.—This is a large, round, pale yellow, red-streaked apple, of the highest cooking quality, and also useful for dessert. November to April.

Gloria Mundi.—One of the finest kitchen apples; in season from the end of September to January, and generally a free bearer.

Rymer.—One of the finest kitchen apples, in season from October to March.

Lewis's Incomparable.—Large and fine, like London Pippin, a capital old apple, of medium size, a great bearer, and of excellent quality. October to January.

Northern Greening.—Medium size, a fine sub-acid apple, in season from November to April.

A Third Dozen of Kitchen Apples may consist of the following:

Lemon Pippin.—Medium size, almost of the colour and form of a lemon, hence its name; firm in flesh, and briskly acid, excellent for cooking, and also good for dessert. October to April.

Peasgood's Nonsuch.—A fine showy kitchen apple, said to combine the good qualities of the Blenheim pippin and a Nonsuch; flesh tender, juicy, and sweet. September to November.

Red Hawthornden.—This is another new kitchen apple of a green-yellowish colour, with a flush of red next the sun. August to September.

Lady Henniker.—A very sweet and excellent newly-introduced kitchen apple; the ground colour is yellow, with streaks of crimson next the sun; flesh fine in the grain, highly flavoured, with a pleasant perfume. In season from October to February, and useful for dessert as well as excellent for all kitchen purposes.

D. T. Fish.—The *Gardener's Chronicle* thus describes this fine new apple: "Large, roundish, flat at both ends, irregular, and obtusely angular, eye small, half closed, set in an evenly-formed shallow basin, stalk short, thin, and level with the base of the fruit; skin smooth, of a uniform clear straw-colour, with small specks of russet, and on the side where the sun strikes it, slightly flushed with crimson; flesh tender, juicy, and with a fine pleasant sub-acid flavour. A very handsome, and excellent kitchen or sauce apple, in use from November till January. Well worthy of cultivation." To this we may add, that it is also useful when large apples may be required on the dinner table.

Nelson Codlin.—Large and handsome, juicy and sweet. October to January.

Carlisle Codlin.—Above medium size, of good quality, early. August to December.

Kentish Fillbasket.—Very large roundish fruit of superior quality; a first-rate kitchen apple. November to January.

Winter Majeting.—A fine large green apple of an agreeable sub-acid flavour. The tree grows freely, and hardly ever misses a crop; one of the most useful kitchen apples. November to March.

Tower of Glammis.—Very large and excellent, brisk, crisp apple. November to February.

Forge Apple.—Rich golden yellow, mottled, with crimson on the side exposed to the sun; an excellent bearer, and the fruit tender, juicy, and sweet. October to January.

Jolly Beggar.—Large pale yellow, tender and juicy; an extraordinary cropper. October to December.

There are, of course, many other varieties of kitchen apple, a few of which, such as Hoary Morning, may be named in our lists of trees suitable for the orchard. But in a general way one dozen varieties may be more useful than three, and three dozen is sufficient for the largest gardens; and it might only embarrass our readers to give a longer list of names.

III.—Apples for Particular Purposes.

Kitchen Varieties Suitable for Orchards, and which, when planted at good distances, will generally grow into fine trees: Alexander, Beauty of Kent, Bedfordshire Foundling, Gloria Mundi, Dumelow's Seedling, Golden Noble, Kentish Fillbasket, Blenheim Pippin, New Hawthornden, Lady Henniker, D. T. Fish, Keswick Codlin, Manks Codlin, Nonsuch, Round Winter Nonsuch, Flower of Kent, Hoary Morning, London Pippin, Norfolk Beefing, Striped Beefing, Rymer, Tower of Glammis, Waltham Abbey Seedling, Yorkshire Greening, Monstrous Leadington, Royal Russet, Cellini, Duchess of Oldenburgh, Cox's Pomona, Fearn's Pippin.

Dessert Varieties most Suitable for Orchard Culture: Adams' Pearmain, Bess Pool, Cox's Orange Pippin, Devonshire Quarrendon, Golden Reinette, Golden Winter Pearmain, Kerry Pippin, Cockle Pippin, Hughes' Golden Pippin, Reinette du Canada, Pearson's Plate, Royal Pearmain, Ribston Pippin, King of the Pippins, Scarlet Nonpareil, Court Pendu Plat, Wormsley Pippin, Maclean's Favourite, Cornish Aromatic, Cornish Gilliflower, Early Red Margaret, Sam Young, Red Astrachan, Winter Quoining, Sykehouse Russet, Scarlet Crofton, Court of Wick, Gravenstein, and Joanneting.

In many of the colder districts of the country some of the finer dessert apples, as well as such fine kitchen sorts as the Calville Blanche, and most of the many other varieties of Calvilles, of which there are now a good many, do best on a warm southern or western wall. Indeed, so much are some of our finer varieties improved by the extra shelter and warmth thus provided, that it would be difficult to recognise them as the same varieties grown in the open air. The Ribston and all the varieties of Golden Pippin, most of the Nonpareils, several of the finer Pearmains,

the Golden Russet, Margil, Ravelston, and Newtown Pippin, Mother and Melon Apples, can only thus be brought to the highest perfection.

For Cordons, among the finer varieties to grow are the following: King of Pippins, Duke of Devonshire, Cox's Orange Pippin, Lodgemore Nonpareil, Scarlet Nonpareil, Northern Spy, Betty Geeson, Cox's Golden Drop, Ribston Pippin, Belle Dubois, Reinette du Canada, Holbert's Victoria, Pitmaston's Golden Pippin, and in warm situations Reinette Grise, Reinette de Caux, the Melon, the Mother Apple, Newtown Pippin, and Calville Blanche.

For Pyramidal, Bush, and Espalier Trees the following are among the most suitable varieties: Early Harvest, Cockle Pippin, Ashmead Kernel, Wormsley Pippin, Adams' Pearmain, Braddick's Nonpareil, Boston Russet, Court of Wick, Hughes' Golden Pippin, Ribston Pippin, Cox's Orange Pippin, Court Pendu Plat, Early Julien, Pearson's Plate, Reinette du Canada, Scarlet Nonpareil, Golden Reinette, Keddleston Pippin, Kerry Pippin, Oslin, Scarlet Crofton, Claygate Pearmain, Red Ingestrie, Yellow Ingestrie, Sam Young, Sykehouse Russet, Sturmer Pippin, Irish Peach, Red Quarrendon, Cornish Gilliflower, and Downton Pippin.

Of kitchen sorts, well adapted for either of these most popular styles of training, the following are among the best and most telling: Cellini—this is among the finest and most beautiful of all apples—New Hawthornden, Keswick Codlin, Manks Codlin, Nonsuch, Jolly Beggar, Lord Suffield, D. T. Fish, Cox's Pomona, Duchess of Oldenburgh, Royal Russet, Dumelow's Seedling, Waltham Abbey Seedling, Bedfordshire Foundling, Gooseberry, Warner's King, Calville Blanche, Alfriston, Brabant Bellefleur.

Apples for Cold and Exposed Situations.—Some of the hardier varieties for unfavourable localities and exposed sites are the Nonsuch, Claygate Pearmain, Sturmer Pippin, Winter Strawberry, Greenup's Pippin, Grey Leadington, Wormsley Pippin, Bess Pool, Carlisle Codlin, Keswick Codlin, French Crab, Tower of Glammis.

For Cottage Gardens.—Among the most profitable apples for a cottage garden are the following: Blenheim Orange, Manks Codlin, Ribston Pippin, King of the Pippins, Reinette du Canada, Sturmer Pippin, Downton Nonpareil, Waltham Abbey Seedling, Bedfordshire Foundling, Warner's King, Alexander, New Hawthornden, and Wormsley Pippin.

If one apple only can be grown, the Blenheim Orange should be the one. If two, the King of the Pippins should be added. Of course, in favourable localities, the Ribston Pippin ought to stand first; but in ordinary positions we would only place it third. The fourth would be Cellini, the fifth Dumelow's Seedling, and the sixth the Royal Russet.

PROPAGATION.

THERE are but two general methods of propagating the apple—by seeds for new varieties and for stocks, and by grafting for the multiplication of the numbers of any and every established sort. Budding and inarching are but varieties of grafting, the latter being but little resorted to in the case of the apple, and the former seldom practised unless for the rapid increase of novel or scarce varieties. A few sorts of apples are also propagated by cuttings, layers, and suckers; but these methods are seldom resorted to unless for the manufacture of stocks. The fact is, the ease and facility with which apples can be grafted has tended to set aside all other modes of propagation. There is also a waste of time, as well as material, incident to most of the other modes of increase. Take, for instance, that of propagation by layers; the branch long enough to form a layer would make, probably, three scions at the least. Again, very few apples produce suckers in any quantity; and those that do, such as the Burknott and some of the Codlins, maintain the troublesome tendency of producing suckers rather than growing into nice fruitful trees all through their lives. Practically, therefore, the propagation of the apple by suckers may be dismissed from consideration for the foregoing reasons, and also for the far more powerful one that hardly any apples are grown on their own roots, and consequently few rooted suckers of popular varieties are obtainable. Suckers are useful for increasing the number of stocks, but some growers even reject them for this purpose, for unless the dormant buds in the buried portion of the stem are carefully removed, stocks raised from suckers are almost sure to betray their origin by growing suckers after grafting. Still, suckers from the Doucin and Paradise stock, and also those from Codlins and Nonsuch varieties of apples, are often used for stocks.

I.—By Cuttings.

Propagation of the apple by cuttings used to be much more practised than now. Before the theory of what are termed dwarfing stocks was either discovered or reduced to practice, it was useful and interesting, as enabling cultivators to have apple trees of almost any size. By a careful selection of medium-sized wood for cuttings, and skilful culture afterwards, it was found that the propagation of the apple by cuttings tended to limit the size of the tree and hasten and augment fertility. Some varieties, such as the Dutch or German creeping apples, the

Burknott, the Keswick, and other codlins, rooted freely with little if any more care than that bestowed on currant, or gooseberry cuttings. Cuttings of one, one and a half, or two feet in length of the current or two-year-old wood were placed in the ground during the winter, and expected to grow during the next spring or summer. The cuttings were generally dug in and placed in rows from a foot to 18in. asunder, and from 4in. to 9in. in the rows. A few of the bottom buds were removed from the cutting, which was cut level across under a bud at its lower extremity. A point was also often made of cutting the lower ends of the cutting over half an inch or so below the junction of the current year's and last year's wood. This left a heel, as it was called, on the cuttings, and it was generally from this heel that the roots protruded. A small trench was then taken out at one end of the ground, and a foot or so of the soil dug over. A straight line was then cut out along the front edge of the dug ground. The cuttings were set in the trench, slightly sloping against the newly-dug ground; a small spit of earth was laid up against them, which was firmly trodden down with the foot on to the base of the cuttings. The digging then proceeded until the distance was reached for another row, which was inserted and treated as before until the whole were inserted. This rough and ready way of treating apple cuttings led, however, to a good many failures, and the latter again resulted in the general disuse of this mode of propagation. The freer rooting varieties did well from cuttings; but some of the more shy rooters gave but a small percentage of plants to the number of cuttings. In many cases, too, the cuttings were far too large—in more, perhaps, they were too strong. Some even went so far as to try to root good sized branches covered with flower buds, and to have them rooted in time to carry the crop through on their own roots the first season. Failing in this, and in rooting many varieties with any certainty, the practice of propagating the apple by cuttings has been generally abandoned. This is, perhaps, to be regretted, for there can be no doubt that with more care in the selection of cuttings and greater skill in their management, the larger number of apples may be propagated in this way. Having our apples on their own roots would enable us to avoid the battles and difficulties and failures of the stocks, and perhaps, at times, to command a larger amount of success in what is known and designated "petit" culture.

It is found, for instance, that moderate sized and horizontal branchlets of the apple root in less time and with more certainty than stronger and more vertical shoots. Not only this, but such branches also fruit sooner and more abundantly, while of smaller size. Thus the way to early and plentiful fruit bearing may be found in the selections of the proper

apple cutting. The same results follow the selection of similar scions—a point too often overlooked in the practice of grafting. Moreover, propagation by cuttings was held at one time to be a remedy for canker, and probably it was in this way: apples raised from cuttings had no tap roots; and if canker, as many held and still hold, is the result of the tap or other deep boring roots touching clay or other ungenial earth or water, of course it follows that if we deprive the tree of such roots as can reach such strata canker is avoided.

The plan of propagating apples by cuttings is mostly reserved now for pot culture, and also as a most interesting amusement for amateur pomologists.

The cuttings may be inserted from November to February, the former, however, or December, being the two best months. Choose and insert the cuttings as already directed; but, in addition, cover them overhead with a close frame, or put each sort in a group or patch to be inclosed under a cloche or handlight. Water when dry, which will not be often, as evaporation is checked by the glass. Shade the cuttings from the midday sun, and about midsummer the majority of them will be found rooted. As soon as this is found to be the case give air freely. As the plants get hardened off, remove the protection of glass and generally plant out in nursery lines early in August, so as to get them established in the open air before winter. Before insertion the top bud of the cutting, if it were a terminal shoot, should always be removed, for were that left on it would start into growth long before any roots could be formed, and so empty the cutting of its stored up juices, or, in fact, starve it before it could possibly refeed itself.

There is yet another method of raising apples from cuttings: this may be called the summer striking of half ripened wood. It is but rarely resorted to, though there seems no reason why the summer striking of apples should not prove as successful as the summer rooting of the half ripened wood of perpetual and other roses. June or July is the best season for this purpose. Choose cuttings of the smaller shoots of the current year, and remove them with a heel of the previous year's wood; form exactly as other cuttings, but leave the whole of the leaves intact. Insert the cuttings in sandy soil in pots, and place them in a close frame plunged in a bottom heat of 60° to 65°; shade from the mid-day sun, and keep a moist atmosphere, so as to prevent the cuttings from flagging, and the result will be successful or otherwise in the ratio of the skill and care with which the cuttings were selected and managed. It must also be admitted that some varieties refuse to root by this method. But the modes of propagating apples by cuttings are worthy of reconsideration, and the practice may deserve revival as a means

of delivering cultivators from the risks of being misled by the wrong stocks, and also of superseding to a great extent at least the necessity of root pruning.

II.—By Seeds.

Apples are still largely raised from seeds for the multiplication of stocks, and also, but very sparingly, for the origination of new and improved varieties. Though it is a singular fact that the majority of our best modern apples have been chance seedlings found in woods, hedgerows, or on the sites of old orchards, the raising of seedlings expressly for the origin of better varieties has been but little practised. The custom of sowing the seeds of cider apples in bulk for the manufacture of stocks has not favoured improvement, while the practice of grafting seedling stocks unproved renders it probable that many a stock may carry a head inferior to itself.

To insure a fair amount of success in the raising of superior apples from seeds, it is needful to choose both parents with care, and to prove before discarding or grafting the seedlings. This need involve but little loss of time; it would cause no loss of material, for the young seedlings would be as good stocks after proving as before. By root pruning, grafting, and other means to hasten fertility, the seedlings might soon be forced to reveal their true characters by bearing fruit. The first fruits might not in all cases be perfect, but they would be sufficiently so to exhibit the chief characteristics of the variety, and to show whether or not it was worthy of a further trial; if not, the seedling would at once be used as a stock for other and better varieties.

The first step to success in the raising of seedlings must be taken as soon as the trees are in flower. The stamens of the seed-bearing variety must be carefully clipped out, to prevent self-fertilisation. The blossoms thus denuded of their male appendages should also be protected with thin gauze or muslin from the influence of the wind and the visits of bees or other winged insects. These precautions are absolutely necessary to prevent the flowers from being chance fertilised. The latter mostly leads to degeneracy rather than improvement, and in either case it baffles the design of the cultivator. When the pistil reaches perfection the pollen of the male parent should be carefully collected, either on tissue paper, or, better still, on a camel hair pencil, and immediately applied to the pistil. It is well to repeat this process on two or three consecutive days, to make sure that the ovary is fecundated. To prevent the risk of mixing the pollen of different varieties, a separate pencil should be used for each two apples the cultivator wishes to cross.

Judgment should also be exercised in the election of parents. Little good, for instance, could be expected from the intermixture of apples of such widely different qualities as the Ribston and the Beaufin, the French Crab and the Blenheim orange, while the crossing of the Golden Pippin and Devonshire Quarrendon, Cox's Orange Pippin with the Ribston or Golden Pippin, and the Kerry Pippin with the King of the Pippins could hardly fail of good results. Again, the qualities of the Ribston might be imparted to our earlier and late apples by skilful intercrossing, while our kitchen apples might be further sweetened by Ribston Pippin, Nonpareil, and other good dessert blood to such an extent as to need little or no sugar in tarts or pies. Already we have a fine kitchen apple that almost realises the necessary sweetness in the Cellini. The raising of apples from seeds with a view of obtaining new and improved varieties thus requires a good deal of nice manipulation and painstaking skill. But care and skill only give zest to a delightful pursuit, as well as add to the pleasures of success, and when they are taken they promise the cultivator a fair amount of success. A note of the proceeding should be made on the plants, and also in a book. Thus Ribston Pippin × with Blenheim Orange, Cellini × with Ribston Pippin, &c. Such data will prove of much interest to the raisers of new apples, and also possess a high scientific value in determining the potency of certain varieties and the success or failure of our attempted crosses. Without some such record the whole theory and practice of artificial impregnation become a mere maze or game of chance. It is also important to choose healthy parents on both sides. It is probable that canker and other diseases in fruit trees are hereditary; and it is better to steer clear of all disease and of constitutional weaknesses in the raising of new varieties of apples and other fruits. Pedigree also often proves a useful key to treatment and a guide to culture; and, for this reason also, careful notes should be made as to the origin of all new varieties. Some raisers adopt a somewhat rough-and-ready method of proving seedlings. All that have narrow leaves are at once used for stocks. Experience shows that nearly the whole of such are closely related to crabs, sour and worthless. On the contrary, broad-leaved seedlings yield a large percentage of sweet and good apples. The rounder the leaf the more chance of quality. This is a simple rule, and may safely be acted upon. There is another sign almost equally, perhaps more, certain—the presence of thorns on the trees is generally a sure proof of acidity or sheer worthlessness. Round leaves and few or no spines combined promise quality, though they may not always give it.

Of course, little of this care is needed to raise seedling apples from crabs, Nonsuch, or other seeds for stocks. Crabs and cider apples are still much used for the stocks of apples for orchards. The seeds are

easily procured in bulk and the seedlings grow fast—two great merits to the raisers and sellers of trees. The apple seeds collected from the residuum of the cider press, and cleared of the mucilage adhering to them, are either sown at once or dried and stored in bags till the following March or April. They should not be kept later, as they do not retain their vitality long. In the former case they are often sown in pots or boxes, or in cold frames in a temperature of 45° or 50°. As soon as the plants are fairly up, prick out or pot off singly, and keep the plants near the glass to prevent them spindling up weakly. By the middle or end of May such plants will be nice stuff to plant out in nursery lines two feet or a yard apart, and from nine to eighteen inches from plant to plant. Here they will make a free growth throughout the summer if planted, as they should be, on a good sweet bit of mellow soil in a sheltered spot, and kept clear of weeds. In the autumn they may either be transplanted to wider distances or allowed to stand a second year in the same place. If the seedlings are those of superior varieties they will, of course, be transplanted in the autumn to make them fruit sooner.

For the mere raising of stocks in quantity the extra labour and protection of glass in winter, necessitated by autumnal sowing, scarcely pays, and the seeds are mostly sown in the open air at once in the spring, either thickly in nursery beds or in lines. The latter is the best mode, as, when sown in beds, unless sown very thinly, the plants are apt to fog off almost before they are large enough to handle or be pricked out in rows or beds further apart.

At the end of the first season's growth the seedlings should be put out in rows four feet asunder, and the plants from a foot to eighteen inches from each other. Here they may remain until they are fit for grafting, which most of them will be the third or fourth season. Little is gained by working the plants too soon. As a rule the stocks should reach a diameter of from three-quarters of an inch to an inch before they are grafted. Much, however, turns on the sort of tree required. Cordons, which, however, are generally worked on Doucin stocks, raised from layers or cuttings, can hardly be grafted too early; while stocks tall enough for orchard trees need time to reach the proper stature and enlarge into suitable sizes. These are generally worked at heights ranging from four to six feet from the ground. Some, indeed, prefer working orchard trees low, and either growing large dwarf trees, or carrying up the first shoots of the scions to form the stem of the future trees. But this involves a loss of time as well as fruiting force, and possesses no advantage in strength or stature over the crab or seedling apple stock. It is better, therefore, on the whole, to allow the seedling or crab to form the stems of the future apple tree, and to graft at such height as

the branches are required to diverge from the main stem into fruit-bearing boughs. For the different kinds of dwarf trees the stocks are generally worked at heights ranging from a few inches to a foot high. The plan of grafting so low down on the collar of the stock, so as to allow the uniting parts to be covered with earth, and the scion, if so disposed, to root into the soil on its own account, as recommended for pears on the quince stock, is not advisable nor needful for apples.

On any of the stocks we have specified the fruit-bearing heads can find enough sap or food and to spare alike for the making of wood and the development of fruit. However, there can be no doubt that apple stocks might be vastly improved were more attention bestowed in the selection of seeds for this special purpose. The refuse of the cider press is hardly the place to find the finest seeds of apples. This can only be expected from the finest fruit gathered off the healthiest trees. These would produce stocks of the highest quality and greater longevity. There can hardly be a doubt that one cause of the sudden breakdown of many apple trees and the weak and debilitated condition of others arises from the constitutional weakness of their stocks. There are even crabs and crabs, and not a few of them are unhealthy. In a fruit so universally mounted on stocks as the apple, too much care can hardly be exercised in the raising and propagation of only stocks of the best quality.

III.—Grafting.

Having thus, by the raising of seedlings from only the finest fruits of the best kinds, and by other means, provided a sufficient number of stocks or enough root force, the art of grafting, which is our next step in propagation, may be defined as the appropriation of the roots of one plant by the tops of another and better. Hence all the other means of propagation seem but preliminary to this. Without root stocks there would be nothing to graft upon; by grafting these we convert wildness or worthlessness into fruitful trees laden with the best varieties.

Grafting may be performed at any time during the growing season; there is no mystery and almost as little difficulty about it. Place the growing parts of two plants or parts of plants together, exclude air and prevent disturbance, and they unite and become one. If both parts, the scion as well as the stock, have independent sources of support during the progress of the union, failure is impossible. This is why grafting by approach, as it is correctly called, must succeed. Each of the two parts is nourished by its own roots during the progress of the union; they therefore unite, as it were, at leisure, without any risk of

failure. This mode of grafting is, however, but seldom used for the apple or such-like trees. It is useful with such hard-wooded brittle-barked trees as the orange and others that are slowly united. We offer an illustration here, rather to set forth our meaning than as a mode of grafting apples. Two stocks, each furnished with independent roots, are brought together, a small portion of the wood and bark are cut off each at the point of union, and both are firmly tied together until they grow into one. (Fig. 1.)

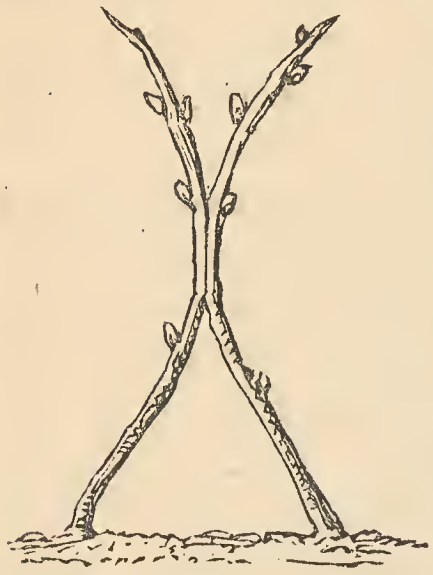

Fig. 1.

Throughout the remainder of these notes on grafting we wish to be understood as writing of a detached scion of one tree or branch, to be inserted into the branch, stem, or, as it is technically called, stock, of another distinct branch or plant. See Fig. 2, in which *a* represents the scion and *b* the stock. It is needful to be thus explicit, as we find that, even after all that has been said and written and illustrated about grafting, there are intelligent men and women who do not yet know the difference between the scion and the stock, nor understand which is which.

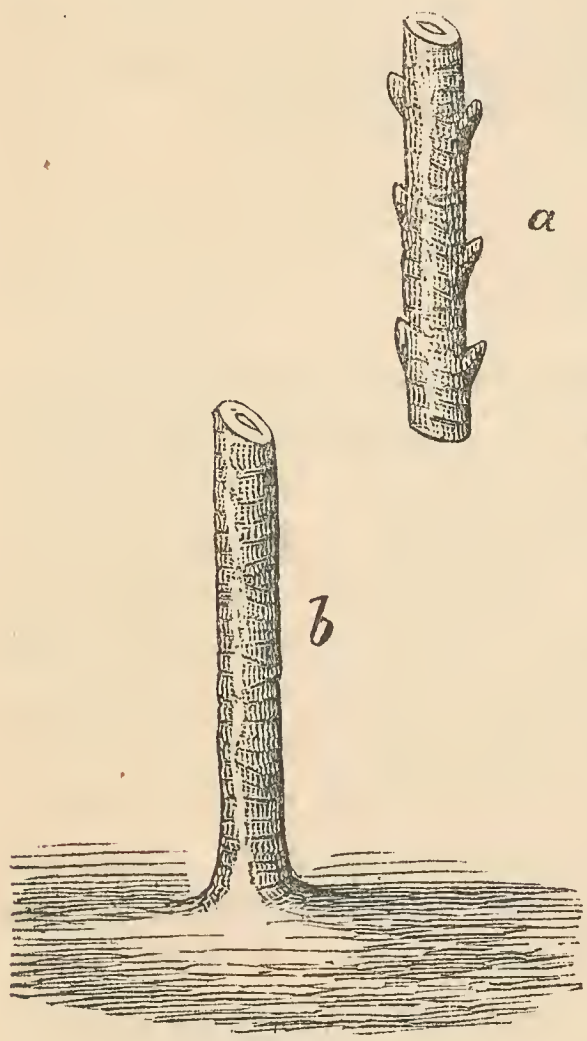

Fig. 2.

It will be obvious, at a glance at Fig. 2, that the complete detachment and isolation of the scion (*a*) must of necessity introduce a new element of danger into the art of grafting. The scion is small, and consequently liable to speedy exhaustion alike of sap and growing force. Time, therefore, becomes important, for it is obvious that if the detached scion is to live in a new position, it must soon be reattached to some other plant that will refill and feed it with fresh supplies of food. For this reason the time to graft becomes a matter of great moment. It has been stated that the growing parts of living plants will unite at any season. But there are seasons when the union is more rapidly effected than at others. The spring time is such a season; therefore, from the middle of February to the beginning of April is the best time to graft. The

season is favourable to growth and also to the conservation of force. Early in the spring the earth and air are moist and cool, and there is little or no waste of the stored-up juices of the scion by evaporation. The early sunshine excites rather than exhausts the sap, and the gentle excitement and motion of fluids thus originated is favourable to the joining together of the scion and the stock. The spring is also a time of rapid growth, and thus it happens that long before the scion has exhausted its stock of fluid a fresh flood of sap is forwarded by the roots to hasten and complete the union of the two parts.

The chief art of grafting may be briefly defined as choosing the right time for uniting the parts and the making of a good match. The two parts of scion and stock must have strong points of affinity. The apple, for instance, should be grafted on some species of apple, or, at the furthest remove, on thorns; and so of other plants. The idle tales we have heard of grafting peaches on willows, and so getting rid of their stones, are as false as they are wild. Apples even on pears speedily die, their natural affinities not being close enough for a permanent union. But not only must family affinities be studied, but the uniting parts of the scion and the stock must be placed in contact. The uniting power reaches its utmost force neither in the wood nor the bark, but in the border land of cambium, or young wood between the two. This cambium is really wood in the process of forming or consolidating, and, as might be expected, if the wood-forming principles of the scion and the stocks are placed in near contact, the two consolidate their power and make one common and indivisible wood between them.

Possibly vegetable physiologists may object to this definition, as very often a union is effected without the wood of the scion and the stock amalgamating into one. All, however, will agree that the most active uniting parts of the scion and the stock should be placed and kept in close contact till the two are united. Both have an important and, perhaps, an equal share in forming the union. It is common, indeed, to speak and write as if the stocks take the scions on, the latter being almost passive agents in the matter. This is, however, by no means the case. The action is reciprocal between the two, and each assists the other in the making or perfecting of the union. If these general principles are recognised and acted on, it is of far less moment what particular mechanical device or mode of grafting is adopted to carry them into practice.

The simplest methods of grafting are mostly the best and the most successful. This is the reason why splice or whip grafting has acquired so much popular favour. Anyone who has spliced a broken walking stick or whip handle, to make either strong, can understand and practise

this mode of grafting. An equal slant on both portions, provided they were of nearly equal diameters, and these two firmly bound together, the two would look again as one. Whip grafting proceeds on the very same principle. It is strong mechanically, besides presenting the uniting surfaces of the scion and the stock to each other in the best possible form for promoting their speedy union. For it will be observed in Fig. 3 that the cambium of the scion is laid parallel with the cambium of the stock along its entire length, and also at the top of the one and the bottom of the other. Of course when the two, as often happens, are of unequal diameters, the cambium of the two can only meet along one side and also at top and bottom. It is quite a mistake to place the scion in the middle of the stock when the latter is the larger in size. To do so is to invite failure along the entire length of the uniting sides. By placing a scion of small diameter in the middle of a stock of larger size, we place the cambium of the one beyond reach of the other, and thus, as far as possible, prevent their union.

FIG. 3.

By whip grafting with a tongue, as in Fig. 4, greater mechanical security is gained, and a speedier union promoted.

Next to the proper preparation of the scion and stocks we would place their being promptly united as soon as prepared. The union should follow the cut with the knife with the utmost celerity. If wind or weather comes in contact with the raw cut of either scion or stock it hinders the union. It will be observed often that the sap follows the cut and oozes out from it. Then the parts should at once be pressed together without a moment's loss of time, the scion and the stock being instantly joined and firmly bound together. There is at once a conservation of force and a mingling of fluids, which directly invites and helps the two surfaces to grow into one. Prompt placing of the raw surfaces together, a good fit, firm and secure tying, and complete exclusion of the air by the usual grafting clay or wax, are the only mechanical aids which the cultivator can render to the vital force of the plants in their efforts to become one. These remarks, of course, apply to all kinds of grafting as well as that of whip or splice now under consideration; though, of course, in crown or bark and cleft

grafting there is less of the wood of the stock exposed, and the importance of dispatch is not so urgent. It is, however, most important in all methods of grafting, for, if the bark is injured, or the juices under it dried up, or the wood of the scion air dried, success becomes uncertain in proportion to the length of time they are rain washed or weather dried before the operation of grafting is completed.

The other most common modes of grafting the apple are crown or bark, cleft or saddle grafting, of each of which we give a brief description and illustration.

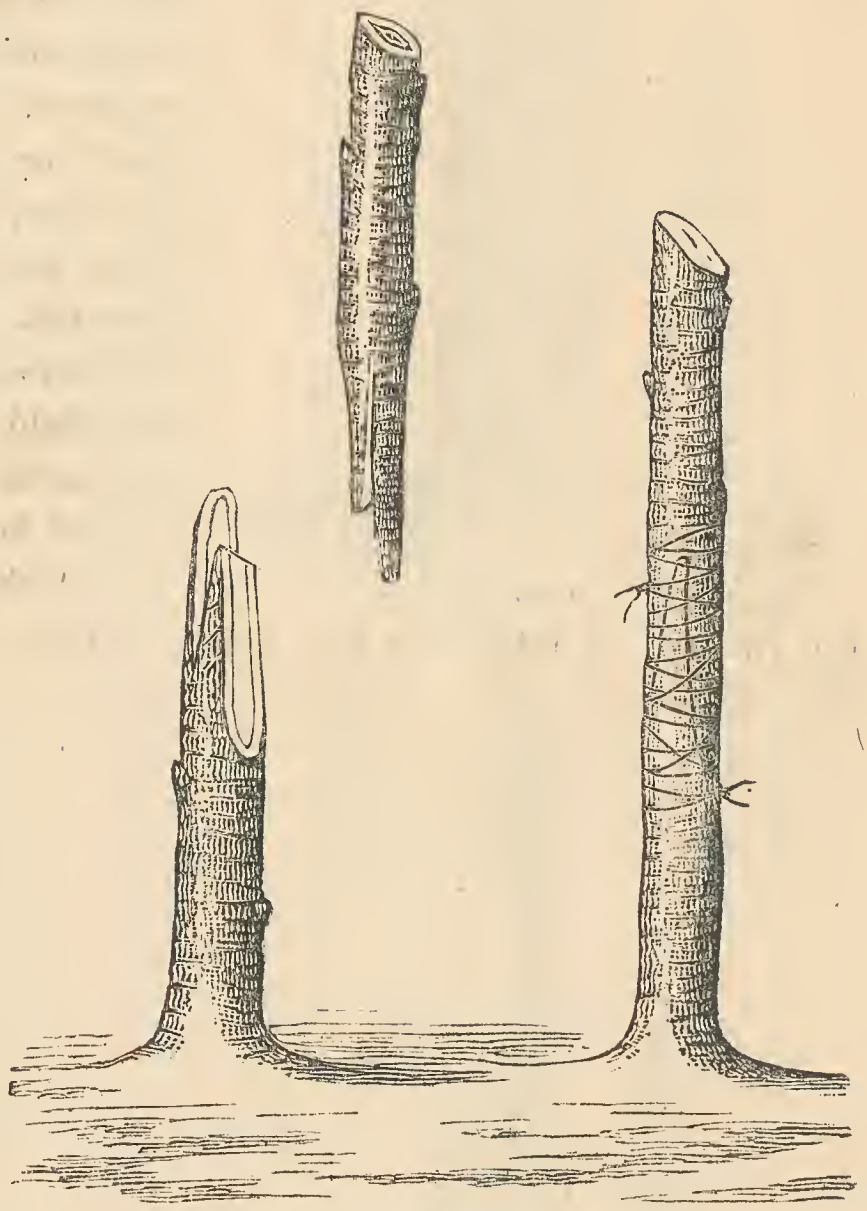

FIG. 4.

In crown or bark grafting (Fig. 5) the most simple method is to remove the top of the stem or branch. This should be done in a sloping direction, so that no wet can lie upon it. Then at the upper or highest portion of the stock make a slice down the bark an inch and a half or so in length, and open the edges with the handle of the budding knife, as in the budding of roses. Then take a slice off the side of the scion of almost the same length as the slit in the bark, and run it down from the top of the stock to the bottom of the slit; tie in position and wax or clay over, and the work is finished. When the bark of the stock rises freely, it is often not necessary to do more than merely run the knife down through the bark and slightly raise it at the top. Then use the scion itself to make its own way down into its proper position. This secures a better fit, and has the merit of not raising more bark than is needful to give it sufficient room. Sometimes in grafting large trees on this method several scions of largish size, two or more years old, are used. These are cut away considerably as far as they are placed under the bark, and the upper portion kept as a shoulder to

rest the scion upon and cover the top of the stock. By such means the bare portion of the stock gets quickly covered over with the growth of the scions, and one cause of weakness and disease, the exposure of wood unprotected by bark, is thus obviated.

Fig. 5.

Cleft grafting (Fig. 6 and 7) is not much practised now. The stock being cut over in the usual manner, is split with a large knife or chisel and held open by a wedge, until the scion, cut away to a wedge form, is pushed into the slit. The wedge is then removed, and the scion closed upon and held fast by the stock. Of course it is important the scions should be placed at the outside of the stocks, so that the alburnum of the two should meet. In this mode of grafting it is well also to leave

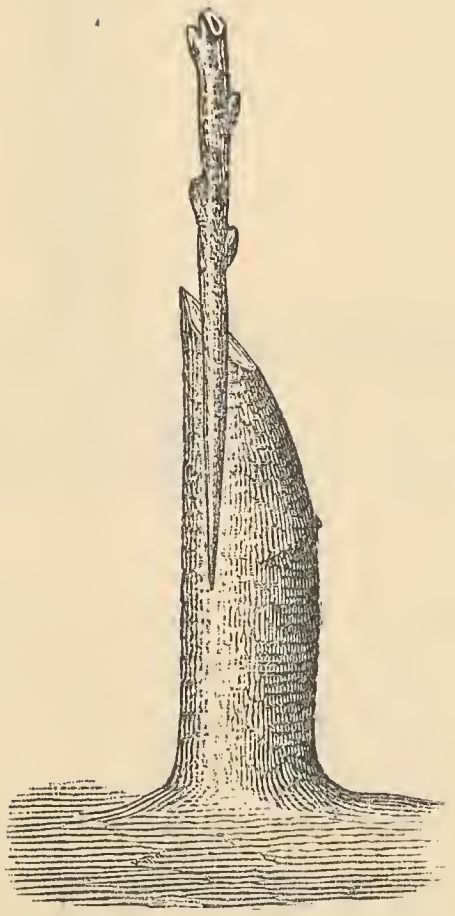

Fig. 6.

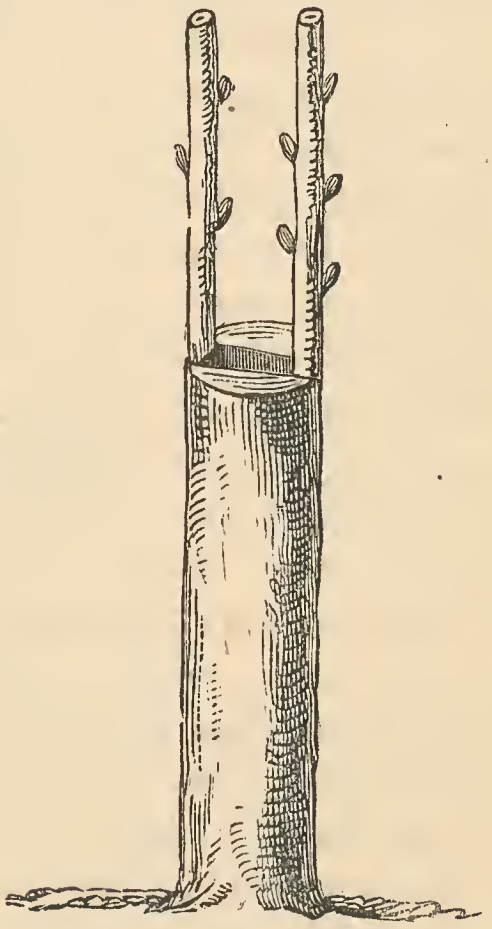

Fig. 7.

a shoulder on the scion, to assist in covering the top of the stock and in protecting it from the weather.

Saddle grafting (Fig. 8) is one of the strongest, most secure, and scientific methods of any. It also succeeds well, presenting a large uniting surface. It is easy to cut the stock into a wedge shape, but rather more difficult to cut the scion into a good fit for the saddle. The latter is essential to success. Properly performed, however, saddle grafting is worth any extra trouble in its careful performance, as it generally proves successful, and leaves no exposed portion of the stock to form a source of weakness or disease. The protection of the vertical parts of the stock with the young wood of the scion is only of secondary importance to the effecting of a speedy and complete union between the two parts concerned in grafting. During the whole time the two parts are uniting the air and light should be jealously excluded. Should the clay crack, or any fissures appear in the wax, these must be at once made good. Supports must also be tied to the stock in the form of small stakes, to which the scions should be tied as soon as they break into leaf, for fear the wind purchase on the end of the leaves should blow them out. After the union is perfectly effected, the ties will generally require loosening, to allow the parts to swell and grow freely. It is safest, however, to keep a loose tie on the parts during the whole of the first season. A little clay or wax also assists the young wood of the scion and the stock to overlap each other, to cover the raw edges of both, and heal all wounds.

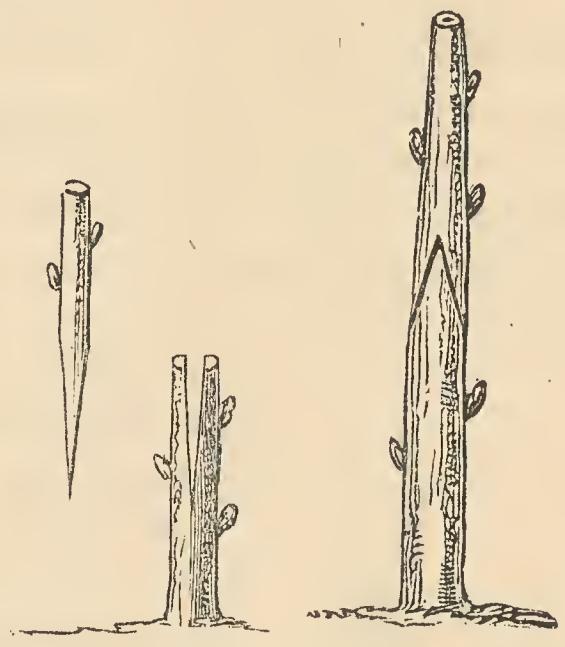

Fig. 8.

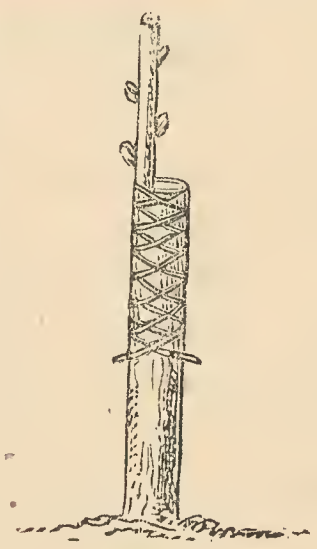

Fig. 9.

Security and the thorough exclusion of light, air, and all other disturbing forces, are of so much importance that the tying and claying or waxing round of the point of union between the two parts ought to follow immediately the insertion of the scion. In tying it is needful to give sufficient compression to keep the parts steady without, however, injuring the bark or young wood under it by excessive tightness. Amateurs mostly err by an excess of tie; it is no advantage, but the reverse, to use a tie either too thick or too long. It is not needful even to make the tie continuous, far less overlap. A far neater, easier method is the simple one of crossing, as shown in Fig. 9. Strong bast or strands of Russian mats

or Cuba bast form the best and most useful ties. Next to these cotton and woollen thread are best. All sorts of hard cord or twine are to be avoided. Some also employ short lengths of gutta percha or indiarubber, and others narrow tape. Whatever is employed should be strong enough to hold the scion in its place, and to bind the edges of the wounds of the stock pretty closely together, and durable enough to keep them so until reunited by fresh growth.

Various compositions or mastics are now fast superseding clay, for the exclusion of the air from the uniting parts of the scion and the stocks. These mastics or waxes are much more simple and cleanly to use than the old-fashioned clay, composed of equal parts strong loam and cow-dung, with a little chopped straw to make it work better. The indiscriminate and excessive use of this led to many failures. Now the different kinds of grafting waxes can be had of most nurserymen. A very simple one is that formed of equal parts of beeswax and resin, with a sixth or eighth part of lard, to give it softness. But, on the whole, many prefer clay, and if properly used, as in Fig. 10, it answers the purpose well. Of course, far less grafting wax than clay is needed to exclude water, wind, air, and light from the wounds incident to grafting until they are healed. Great care is needed in the application of these materials, so as not to displace either the scion or the bark. And in any cases where the wax or clay cracks off before the union is effected or the wounds are healed, it must be carefully replaced, as a fracture in the plastering matter around the grafts would often hinder or prevent a proper union.

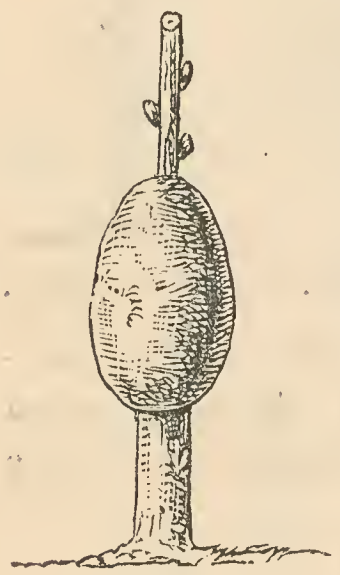

Fig. 10.

As we have seen, much of the success of grafting depends upon neat and expert manipulation, and the careful adjustment of the growing points to each other, and keeping them in contact without interference till the two grow into one. But much also depends on a wise selection of stocks and scions. Of course only good varieties will be chosen, and wood in the best condition. The latter may be said to be that of moderate strength, of horizontal rather than upright growth. Scions should also be a week or fortnight later than the stocks. If the scion is abreast or ahead of the stock in the matter of growth, most of its sap or growing force will be exhausted before the stock is sufficiently advanced to flood it with sap, or the scion has had time to do its proper part to form a union with the stock. The amount of vital force in the scion is necessarily limited. Whether large or small, it is, consequently, soon exhausted.

If this happens before it unites with the stock, of course union afterwards becomes impossible. Hence the importance of the scion being in such a semi-dormant state that its juices can neither be speedily dissipated by a dry atmosphere or bright sunshine, or wasted by premature efforts at growth.

The stocks should be healthy and vigorous, well rooted, and, as far as possible, of suitable size. They should also be chosen with a due regard to the future size and uses of the trees grafted on them. For example, for orchard trees there are few better stocks than seedling wild crabs, or seedling apples of strong growing varieties. For half-standards, or orchard trees of smaller size, the Siberian Crab forms a good stock. For espaliers, pyramids, wall trees, or large bush apples, the English or Nonsuch Paradise or codlins, raised from layers, make the best stocks, and for all smaller plants for pot culture, cordons, and very dwarf bushes, the French Paradise or Doucin form the most suitable stocks. It is possible, by repressive culture, root pruning, severe pinching, and a poor soil, &c., to starve even the freest stocks, so as to produce dwarf trees, but the process involves a loss of time, skill, and material. And it is important in the culture of the apple to choose the best stocks for specific purposes; the trees then naturally, as it were, assume the forms and sizes wanted, and fall into the cultural grooves and niches appointed for them. So important is this matter of a wise selection of stocks, and so seriously does success or failure depend upon it, that growers for sale ought to warrant their stocks as horse dealers give a warranty with their animals; and an action for compensation in case of a false warranty ought to lie in the former case as in the latter.

TRAINING.

"As the twig is bent the tree's inclined." In this common proverb we have the philosophy and vindication of training in a nutshell. Nature's methods are not always those of the cultivator. Nature is seldom in a hurry; she can afford to wait. Neither is she cramped for room. The wide world is her garden, the long ages her seasons for furnishing the same. If cramped for space, her remedy is extirpation, her short cut to it the survival of the fittest. Might is Nature's canon of right; and she enforces it with inexorable firmness and unflinching persever-

ance. Training is often condemned as an unnatural proceeding, and so it is. But so likewise are most of the cultivator's aims and conditions. Primarily, we may be said to train for two purposes—to save time and economise space. These two are, perhaps, the most important factors of profitable culture. All things are possible to time and space, worked with diligence and skill. Nature's mills, like those of the gods, grind slowly: they also grind small. A slow rate of speed and small or doubtful results at the end thereof means poverty or ruin to cultivators. Hence the immense importance of training as a time saver. The skilful trainer takes growth, as it were, in its raw and half-formed state, and moulds it into usefulness. He is a utilitarian philosopher in theory and practice from the first. True, he may try and likewise succeed in gilding utility with beauty; but, however much he may affect beauty of form, his main object in training the apple and all other fruit trees is profit. The skilful trainer arranges more fruit-bearing wood into a given area than the unskilful. The object of all good training is conservative and constructive, not destructive. Those who train least often prune most, and this of necessity. Once allow the production of useless wood or branches in the wrong place, and they must of necessity be destroyed to get the right material posted in the right place. Skilful training will almost supersede pruning. Here we have placed training first, to give practical emphasis to this lesson. Much of our prunings are simply the outgrowth of our neglect of or mistakes in training. For not only can the form of growth be changed by training, but its character.

We can train for timber; we can also train for fruit. Even the mere position of a branch may cover the whole difference between the one and the other. It may seem a small matter whether a tree shall grow erect or horizontally, or whether it shall droop or weep from the horizontal line. And yet, on such alterations of the main positions of the growth of its shoots may hang all the difference between sterility and fertility. The natural bent of all young apples is enlargement. Hence most of the shoots are sent straight up as high as possible into the air. Those who break and start on other lines turn up as soon as they are fairly free of the parent stem or branch. The majority of buds point at a more or less acute angle skywards. Besides, only the upper buds on most shoots break into fresh shoots the following year. All this is in harmony with Nature's ordinance, that the tree was formed to mount as fast and as far into the air as possible. The result is height at the expense of symmetry and compactness. In giving free room to this natural tendency time and profit are both sacrificed, and form also. Fig. 11 is a fair illustration of this natural tendency. If left as shown, only the top buds would break the following season, and all the others would re-

main dormant. More, these top ones, if left untrained, would provide probably from three to six duplicates of Fig. 11. They would be equally vertical, as far as their numbers would allow, and almost equally strong and thick. The skilful trainer, however, may easily manipulate Fig. 11 into Fig. 12. The change in the size of the buds is in such cases simply the result of the change from the vertical to the horizontal position. Each bud along the whole line of the shoot or branch is stimulated to swell by its altered position. This result would be even intensified if the growing end of Fig. 12 were made to touch the ground. The stimulus on the buds and their efforts to swell out into full size or even be transformed into fruitfulness would then be greater than when the shoot is run along horizontally with the ground, as shown in Fig. 12. Pruning is often used as a substitute for training in regard to these two forms; thus many allow Fig. 11 to grow as here shown—in fact, it is the common normal style of maiden apple or other fruit trees. It would, however, have been better to have grown it in the form of Fig. 12 from the first. But that not being done, then, instead of cutting back Fig. 11 to within a bud or two of the bottom or ground line, the whole of the top should be left at length and tied down the second year, as in Fig. 12. It will make little or no wood, but many fruit buds, so that at three years from the grafts a fruit-bearing tree will be produced. And this is one of the greatest triumphs of the saving of time and the

FIG. 11.

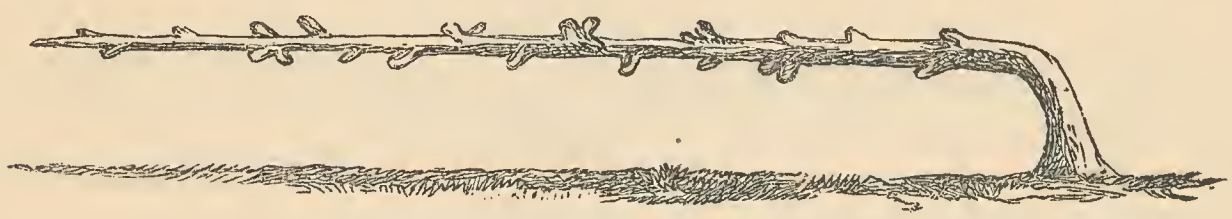

FIG. 12.

securing of profit by skilful training. For by it alone fertility is alike hastened and augmented. In Fig. 13 the same principle of training is carried over a larger area. By allowing the young tree to describe a spiral movement, Nature's desire to mount is gratified, while the buds are also forced out into prominence or converted into fruitfulness by their semi-horizontal position. In these, and other methods that might

be named, the tree has received no check or stop. There has simply been a modification of growth and fruition by altered positions, rather than changed condition. The trainer has effected much with little or no interference with Nature. We give a simple illustration of this in Fig. 14. This is the result of stopping Fig. 11 above the first two wood buds formed on it. Fig. 14 may then be produced in the same time needed to grow Fig. 11. Maidens, with two arms at right angles, might just be as common, under skilful training, as vertical one-shoot trees. To grow Fig. 11 into a fishing rod, to be cut off for a flower stake in winter, and produce Fig. 14 the following season, is simply to waste a season's sun and shower and to lose a whole year. Diagonal training possesses the merits of horizontal training, though in a lesser degree. Maidens may be trained into this form and crossed, so as to make diamond cordons, as

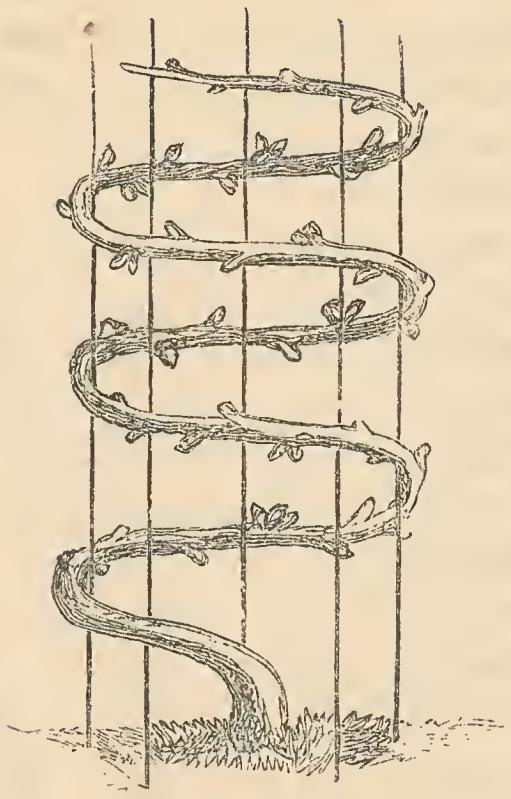

Fig. 13.

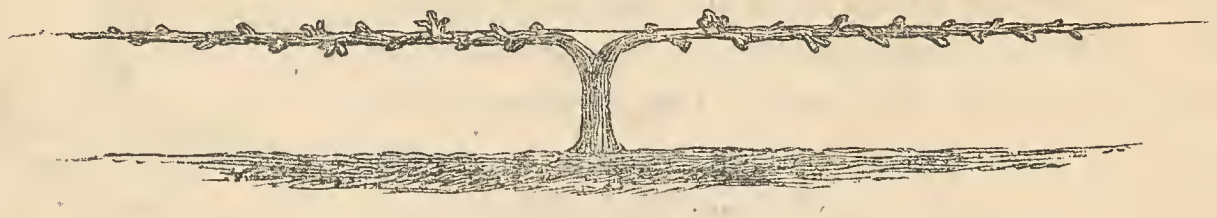

Fig. 14.

shown in Fig. 15, or single lines laid parallel to each other at any angle diagonally. The more obliquely they are placed the more will the buds be developed throughout their whole length, a point of much importance to the beauty and usefulness of the apple. If any of the buds remain dormant near the ground lines, such buds are a sheer loss of productive or feeding force. Cordons should be fruitful from base to summit, and all unfurnished parts represent a loss of produce as well as of time and space. An unfruitful tree, or one carrying half a crop, absorbs as much of the former and occupies as much ground as one in full bearing throughout its entire area or length.

Fig. 16 is a modification of horizontal training, well adapted for apples. Horizontal trees used to be almost universal in kitchen gardens. In most of these the side shoots proceeded from the main stem, at right angles with it. The circular bend at the point of departure, as shown in

Fig. 16, not only looks better, but is of great service to the tree. The sap is slightly arrested in flowing round the curve, and that resistance to growth is sufficient to fully develope the buds on the curved part. After

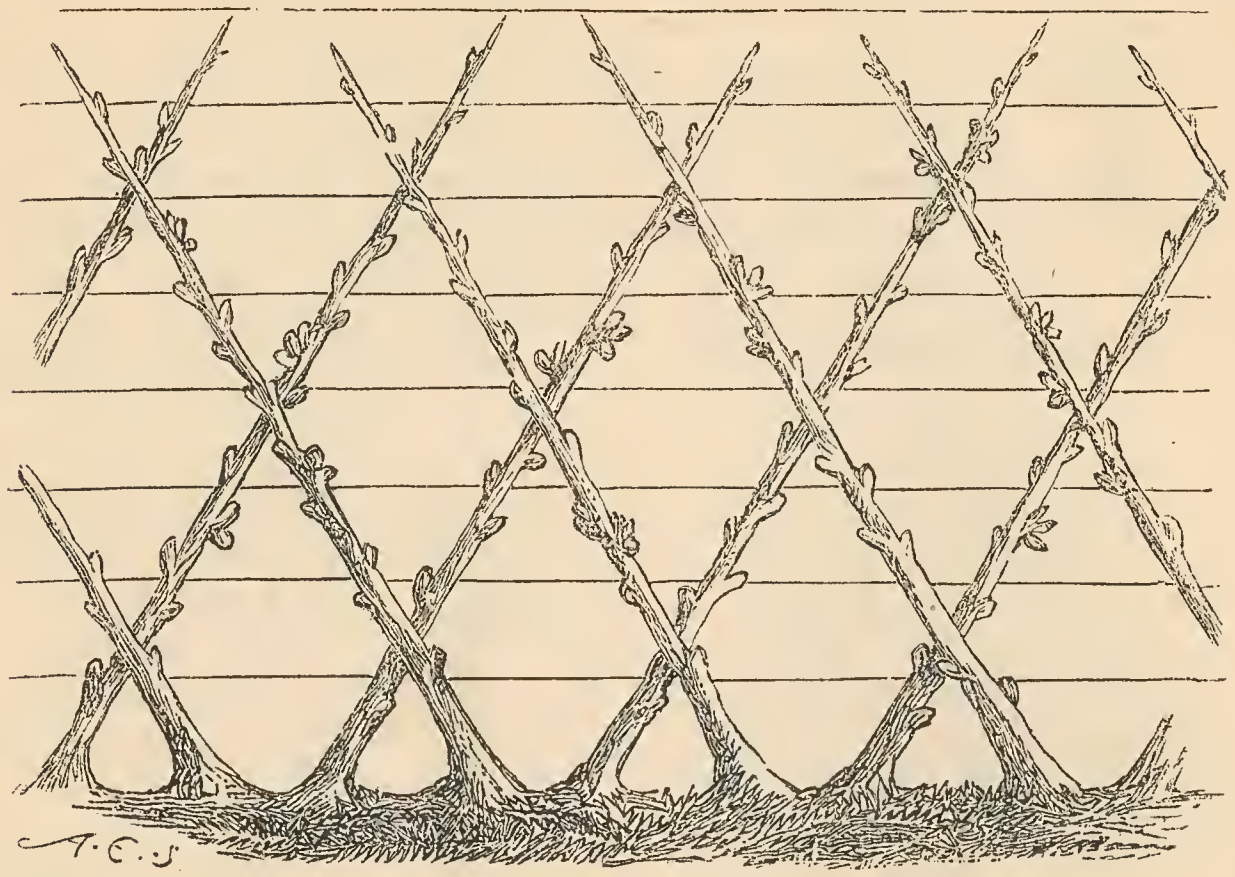

Fig. 15.

a time the sap possibly flows round the bend just as freely as along a straight line. But that is of no consequence. It is the first flow round the

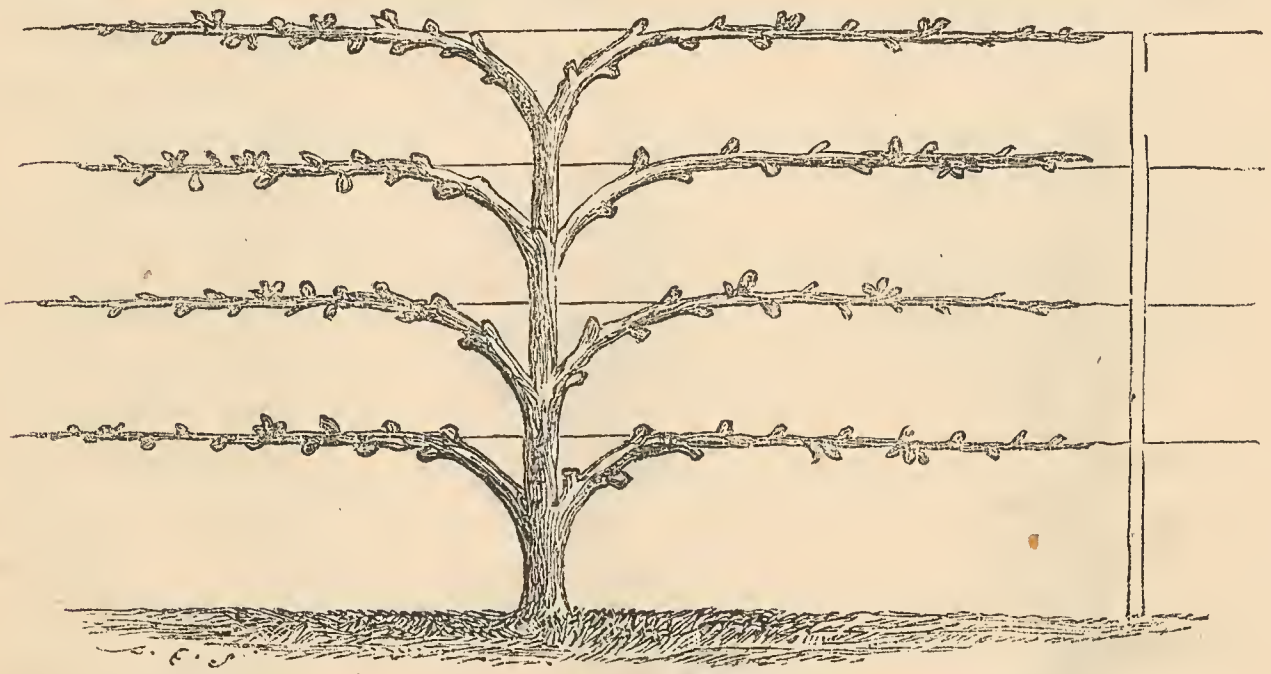

Fig. 16.

curve that needs a check, to give abnormal prominence to the bud near the stem, and these, once fully developed, can take care of themselves.

Such a tree as Fig. 16 will probably take about four or five years to form. The best modes of proceeding is to start with Fig. 14, only leave

a leading shoot in the centre proceeding nine inches or a foot beyond the two lower branches. This will break the two upper buds and produce the second pair of branches. The leader is then allowed to proceed as before, and so on until the height of the wall or espalier is reached and the tree fully furnished. By stopping the leader twice or three times during the summer, vigorous trees will occasionally produce two or three series of side branches in one season; and this skilful training, combined with free growth, economises time and hastens and augments fertility. At times, too, the centre or leader of the tree, instead of being carried up straight, is trained in a waving or semi-spiral manner. This form will be illustrated in our handbook on pears.

FIG. 17.

FIG. 18.

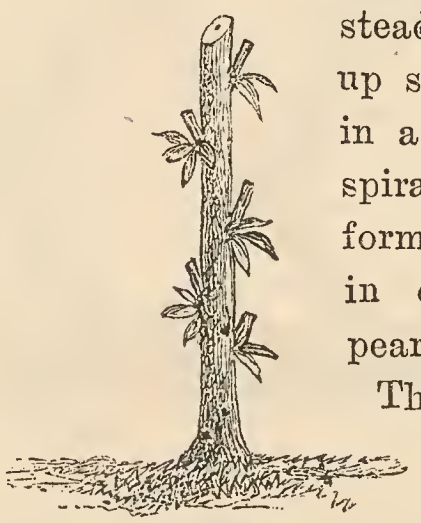

FIG. 19.

The most useful other forms of training the apple are perhaps the dwarf bush, Figs. 17 and 18; the pyramid or cone, Figs. 19, 20, 21, and 22; and the standard, or orchard tree, Figs. 23, 24, 25, and 26. Fig. 17 shows the bush tree at the end of the first season's growth under proper training. Left to itself, it would have been like Fig. 11. Under judicious management, the growth is so directed as to form the basis of the future bush tree. With but little attention the same tree would develope into Fig. 18 the next season. The great use of early training is to form good habits.

FIG. 20.

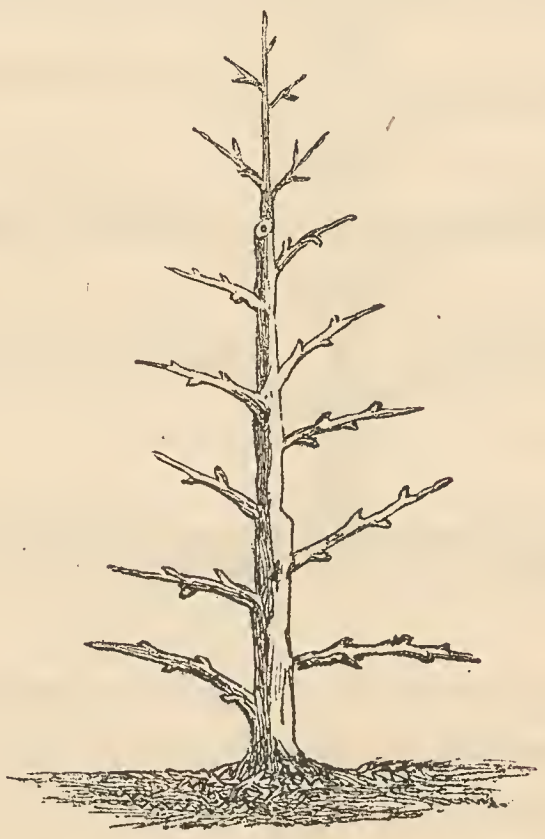

FIG. 21.

Like produces like in wood making and fruit growing, as in almost everything else. The trainer has only to show the tree what sort and form of wood it is expected to make, and Nature will speedily better his instructions. A masterly inactivity often represents the highest skill in the training of apple and other fruit trees. The foundation, again, of the pyramidal apple tree is shown in Fig. 19. This, again, is the much cited Fig. 11 stopped once, say, in the middle of June. The stoppage developes the lower buds, and prepares it for growing into Fig. 20 the following season. It will at once be obvious that the natural results of Fig. 20 are Fig. 21 and Fig. 22. The art of training, like that of building, largely consists in the laying of a good foundation. This, well and truly laid, becomes at once a basis and a guide, and the house or tree alike rises up or grows into proper form as a matter of course.

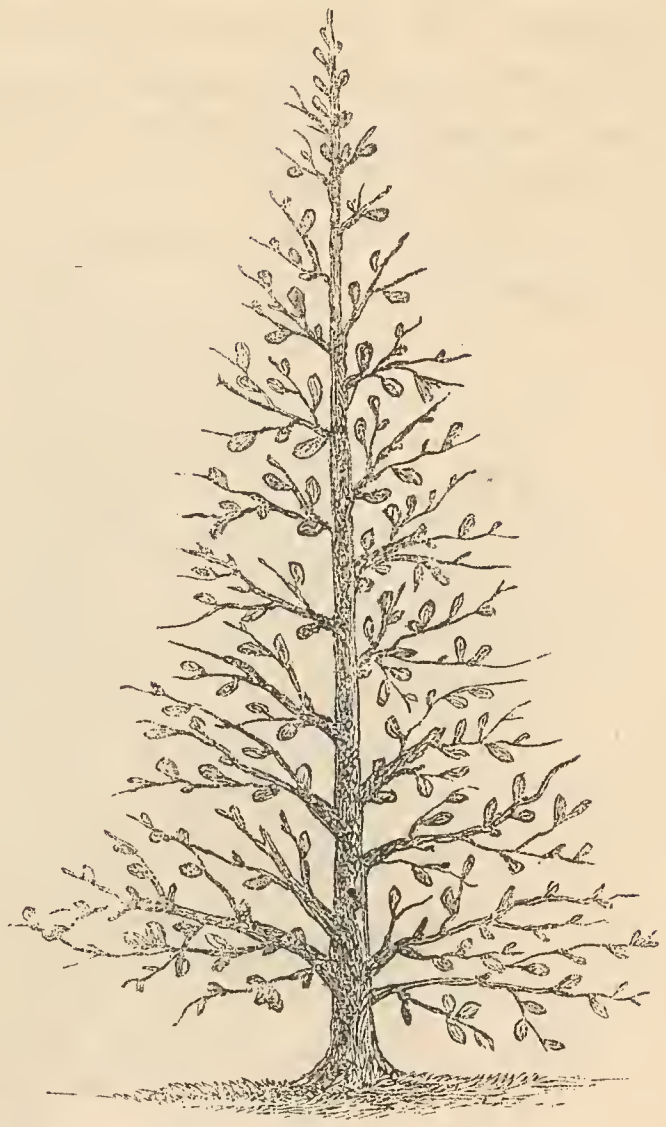

Fig. 22.

The same principle of progressive development is illustrated in Figs. 23, 24, 25, and 26. Stop Fig. 11 near the top, and the rudiments of Fig. 23 may be formed the first season. Starting with 23, it needs little skill in training to produce Fig. 24; and Fig. 25 and 26 grow out of these two almost as certainly and readily as twice two make four. It has been contended that apple trees of the style

Fig. 23.

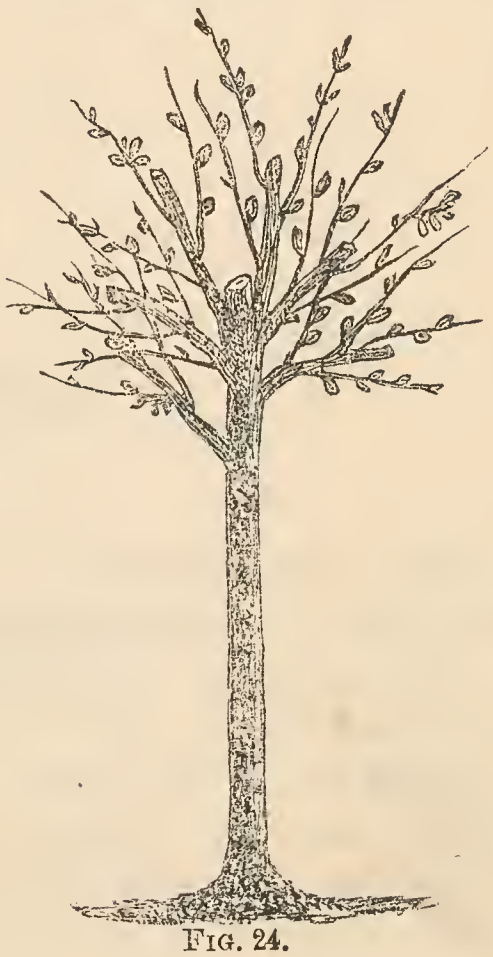

Fig. 24.

and character of Fig. 26 will grow of themselves, without any training whatever, and, no doubt, occasionally such might be the case. Apple trees vary very much in habit and style of growth. Some are straggling, others compact; some produce many shoots, others but few; some make little, others much growth. Hence the necessity of skilful training. What if a few orchard trees might fruit well and early, and mould themselves into a good shape without training? The majority would not, and the

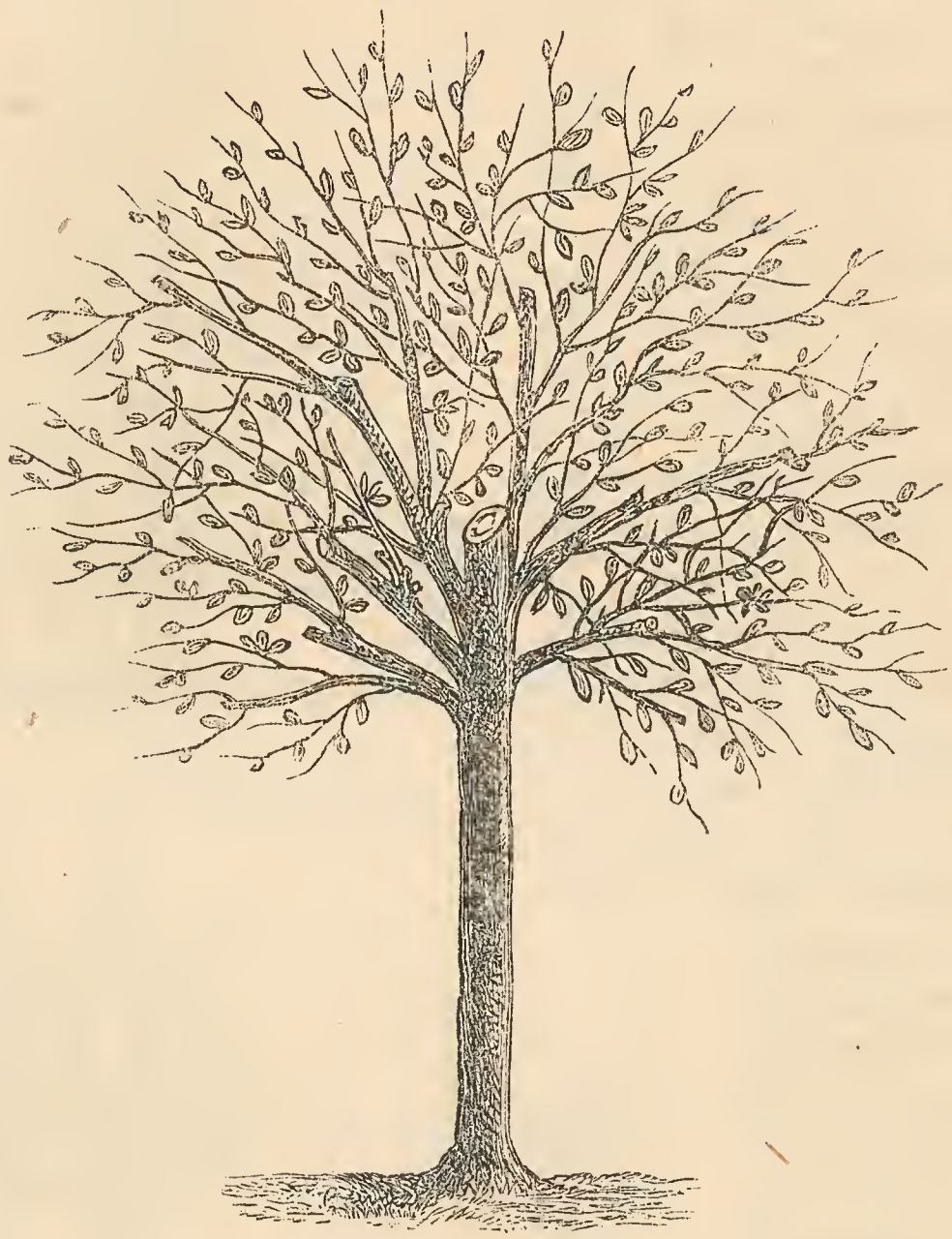

Fig. 25.

object of the cultivator is to have all his trees well formed and fully furnished with fruit-bearing wood in as short a time as possible.

Form, it is true, is of secondary moment to fertility; but it may generally be made to add to fruitfulness, and also to add to the pleasure afforded by all fruit trees in gardens. Upon the form of trees also depends an equal supply of food to their different parts. To ensure this object the skilled trainer will always, if possible, concentrate the greatest amount of strength in the lower parts of the tree and those

furthest removed from the perpendicular with the roots. Remembering Nature's partiality for this line, he will try to baulk her, and lead growing force into the other parts of the tree. This is often done by bending, weighting, or stopping the vertical shoots, and at the same

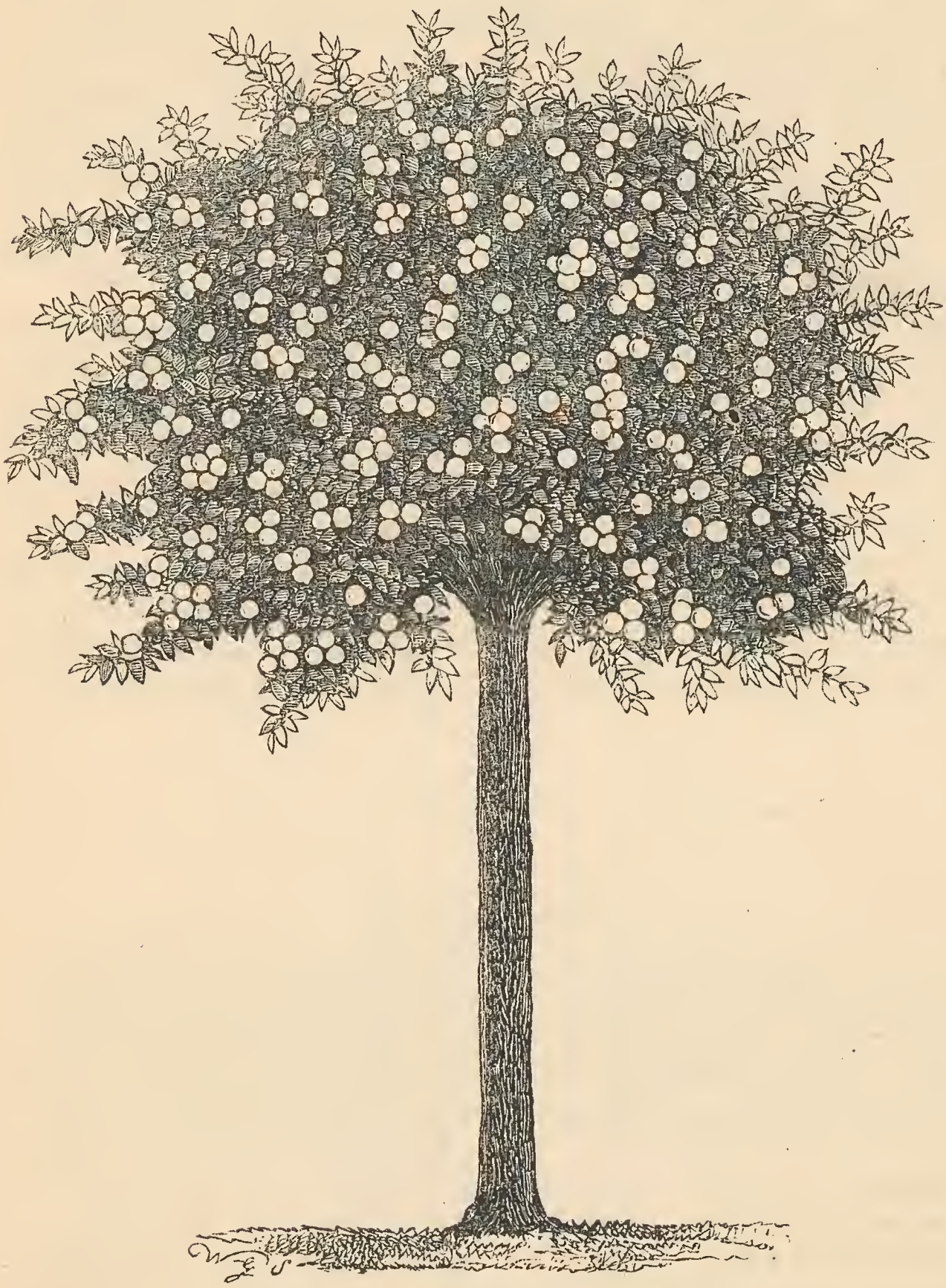

FIG. 26.

time fostering, by every possible means, a free growth in the horizontal ones. The trainer also studies to distribute an almost equal amount of light, heat, and moisture to every part of the tree. The rule of the

strongest is not only Nature's law in regard to different plants, but the different members of the same plant or limb of the same tree.

Left entirely to themselves, the strong branches of apples overmaster and destroy the weak. This results in a lack of symmetry and a loss of space. The trainer, by generalising growing force to the utmost, gives to each part its due portion of food in season, and ends the rivalry of the boughs by satisfying all. He also prevents them from crossing, overshadowing, or injuring each other. No dense shadow of leaves and spray here, no waste vacant area there. All the space allotted to the tree is fully occupied, without injury to other trees or to any part of the same tree. The tree is also so formed and trained that the showers can refresh and the dews nourish the whole of it.

Untrained trees suffer incalculable injury from the upper portions shedding off the rains and the dews from the under; growth is weakly, fruit small and worthless on the lower parts of apple trees, very often from this unsuspected cause. By developing the lower limbs the most, the whole tree is equally watered and nourished, and the produce alike good over its entire area. Light, heat, and moisture have free access to every part of the tree; and hence each one, of whatever form, grows up under skilful training a model of health, beauty, and fertility. Of course this perfect model is not always reached in practice, but nothing else and nothing less should satisfy the cultivator and lover of apples.

PRUNING.

PRUNING differs from training, inasmuch as all pruning removes growth already made. It is the removal of part of the stem, branches, leaves, or roots. Much of the necessity of pruning arises from the neglect of early and better training. What correction is in moral training, pruning is to plant life and growth. Bad habits, principles, diseases, can only be eradicated by suffering. So wrongly-placed, useless wood has to be removed by pruning. It is cut away in order that better-placed or different and better growths may come in its place. Nevertheless, pruning, though needful at times even to perfect training, represents a waste of force. Had the growth been properly watched and moulded in the making, the probability is that none of it would have had to be removed. But, taking things as we find them, a certain amount of pruning may be held to be needful. The fancies of trainers, the limi-

tation of space, the craving for early maturity, all have to be met and gratified, often by the use of the knife. As the knowledge of the laws of life and conditions of growth extend, cultivators will, no doubt, train more and prune less. But the time is probably yet far distant when the pruning of such trees as the apple will be abandoned. The place of pruning has been changed, the extent of it much reduced, but the practice is yet general. In fact, unless we could sow the seeds of our trees where they are to remain for life, and graft them where sown, we cannot, if we would, avoid root pruning.

I.—Root Pruning.

Root pruning, which is necessarily practised at each removal of the trees, is by far the more potential sort of pruning. Prune the tops, and they grow again with perhaps as much as or more vigour than before; prune the roots, and the entire character of growth of root and top is modified

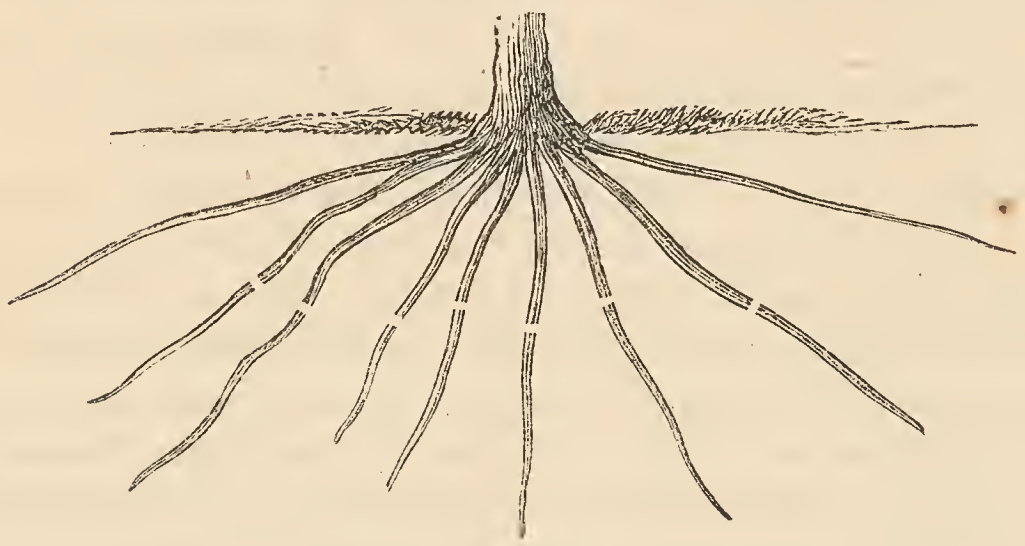

FIG. 27.

and changed for life. So much is this the case, that, if once a fibrous habit of root is established by pruning, apple trees may need no more pruning throughout their lives, where they have room to develope themselves, as, say, orchard apple trees. Root pruning may thus render top pruning wholly unnecessary. Trees are often thus said to be unpruned, that have been pruned in the most effectual way, and once pruned so well as to need no further pruning.

Great mistakes are also made in regard to root pruning. So long as a certain number of roots are removed, some seem to think it of little or no matter what roots are removed or where they are cut from. This is quite a mistake. It often makes all the difference where the roots are cut from. Those nearest the surface have a tendency to form fibres if not root-pruned. As a rule, the more fibry the roots, the less pruning they need. In Fig. 27 the horizontal roots may be left, and the

vertical ones cut off where marked. Root pruning, when properly practised, is less an expedient for reducing the number than a means of modifying the character of the roots. Perhaps few trees have an excess of roots, if posted in the right place and of the right sort. As far as the making of wood is concerned, the more roots, and the stronger, the more and finer the timber. Root pruning would be altogether a mistake for the wood grower; but where fruit is the main object, root pruning is assuredly a safe and short cut to early and permanent fertility. Root pruning changes the character and the place of the roots, and so revolutionises the entire tree. It compresses fertility into less space, in less time, and produces a larger aggregate. Some condemn root pruning as unnecessary and unnatural; it is neither. In fact Nature herself root prunes. The hardness and shallowness and poverty of natural strata prune the roots by wholesale, or effect similar results to actual pruning. They are stopped perforce, and compelled to break the one boring root into many fibrous ones. The roots overcrowd each other also to such an extent as to produce analogous results to root pruning. Root, in fact, is the most important, and therefore the most general mode of pruning.

The perfect pruning of the apple is a chain of three links, only of unequal length and strength. Root pruning is the largest and strongest of the three; the second of most strength and value, is summer pruning; and the last, which in fact may at times be altogether dispensed with, is winter pruning. The three are mutually dependent, and give to pruning a unity of purpose and design. In general terms, it may be stated that the more skilfully apple trees are root-pruned, the less summer pruning will be needful; and if these two are properly managed, the winter pruning will be of the lightest. This, too, ought to be the aim of the skilful pruner, to modify the issues of growth to such an extent by his action on the roots that the least possible amount of useless growth shall be produced as food for the knife, the most unprofitable product within the whole range of horticulture.

The time to root-prune is important. As a rule October and November are the best months for the operation. Roots may then be sufficiently exposed to reveal their character without too severe a check to the tree, and barren or sterile roots shortened back at that season quickly develope into a network of fibres as shown in Fig. 28. The season is also one of more leisure in the garden than perhaps any other. For these, and other reasons, October and November seem the best months for root pruning. But some prune much earlier. As soon as the crop is harvested, apple and other fruit trees may be root-pruned with safety. The check is more severe when root pruning takes place earlier. Apple

and other trees have even been root pruned in July with great benefit. It is needful to be cautious in root pruning so early, alike as to the manner and extent of it. And root pruning should at no season be carried to extremes, nor done in a reckless manner. It is such modes of performing a most delicate surgical operation that has brought by far the most successful and scientific mode of pruning into disrepute in not a few cases. If the object of all proper pruning is to limit the size, improve the form, and hasten and heighten the fertility of trees, then root pruning is the best for all these purposes. It prevents overgrowth, regulates and equalises its strength, and turns the growth made into fruitful channels.

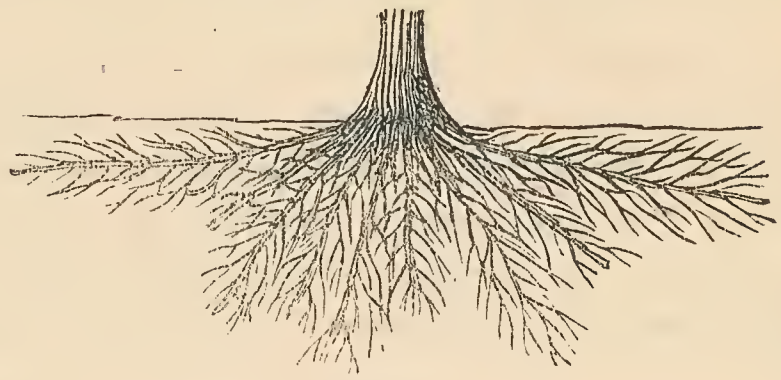

FIG. 28.

Top pruning ought to be adapted to root pruning as the key fits the wards of the lock for which it was made. Mere routine or empiricism must never be allowed to wield the knife on the roots of trees. The root pruner may do his work so well that no top pruning may be needed, for fertility is a far safer, better, more effective pruner than the knife. Give an apple tree a good load of apples to carry by means of skilful training or root pruning, and there will be little fear of any excess of wood to need cutting away. Fertility is the best antidote to excessive growth, and the surest and most permanent remedy for sterility.

The mode of root pruning is simple. Some adopt the savage practice of describing a circle a yard or so in diameter round the tree and cutting everything off at that radius with a sharp spade. This removes all the best roots, and leaves all the worst ones intact. The proper mode is to remove all the earth from the chief roots of the tree to a distance from the bole ranging from a foot to a yard or more, according to its size, and shorten them back according to their condition—those that are thickest and have fewest fibres most, those that are weakest and have most fibres least or not at all. Meanwhile all vertical roots within a foot or eighteen inches of the collar of the tree are cut off. The soil, or fresh earth if needed, is then replaced, the surface of the earth mulched over with a frost and drought proof covering, a strong stake if needful put to the tree to keep it immovable against wind and weather, and the operation is completed.

The condition of the tree and the roots will mainly determine the amount of root pruning; but, of course, regard will also be paid to

the size of the tree. If it is small, as a cordon or bush, and the space set apart for it is correspondingly limited, and the roots are strong or numerous, the root pruning will be correspondingly severe. If these conditions are reversed, the pruning will be light in proportion.

On no account should the roots and top be pruned simultaneously; root pruning gives sufficient check for the time. To prune top and roots together is to cripple life and vitality at both ends. Possibly part of the elaborated sap in the branches may find its way down to hasten the formation or quicken the growth of new roots. Be that, however, as it may, experience shows that it is as impolitic as it is unprofitable to prune the tops and bottoms of plants at the same time.

II.—Summer Pruning.

Summer pruning is next in importance to root pruning. The former modifies growth in the making; the latter moulds it into new forms or removes it. It will be seen at a glance which is the more important. Summer pruning operates, of course, on the young wood, technically called breast wood. Each wood bud that breaks grows into a shoot, and these, if all left to grow at will, change the well-ordered, skilfully trained trees into a tangled forest in miniature. A certain extent of growth may be permitted to most or all these shoots. They stimulate the roots and flush the tree with sap and life. But it is needful to remove some and stop all, or nearly all, of these young shoots of the current year, or breast wood, to compact fertility into smaller areas, post it in the best places, and produce it in the least time. That system of pruning that concentrates the greatest amount of fruit in the least space consistent with the health of the tree must have many merits, if it be not the very best. Leave young wood unpruned in summer, and the fruit buds, if any, would be found on the end of the growing shoots. Not only this; but where the best buds are found on the highest point of the shoots, the lower ones either do not break at all, or are worthless if they do. Thus the fruit buds are found on the highest points, and the tree occupies a larger space, without being more productive, as is shown in the unstopped branch of Fig. 29.

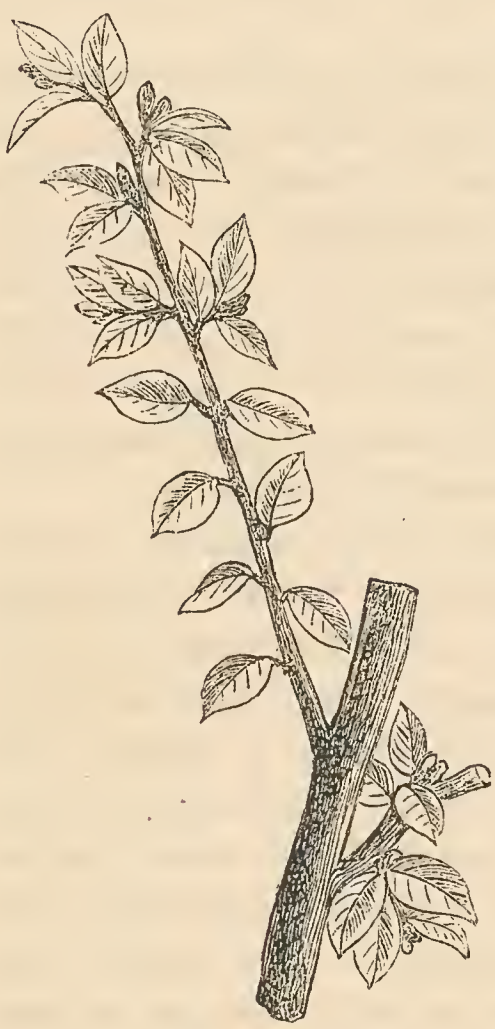

Fig. 29.

Summer pruning also puts the fruit in the best places. It probably makes no inconsiderable difference to the perfect swelling of fruit whether it is placed near or far from the main branches. Placed on the highest point of the branches, the fruit no doubt gets more fully exposed to light and air. But the advantages arising from this are probably largely neutralised by the distance of the fruit from its main or leading supplies. By a proper system of summer pruning the fruit may be as fully exposed to light and air as is possible, while it is posted near to the main currents of the sap or leading branches of the tree.

But summer pruning is also a time-saving as well as space-husbanding expedient. A year or more is often saved by judicious summer pruning or stopping. It accelerates as well as augments fertility. It converts mere growing force into fruitful condition, and more is done in a few months to establish and perpetuate fertility by summer pruning than is often done in as many or more years by winter pruning.

The success of summer pruning depends a good deal on the time when it is done, and the extent to which it is carried. Prune too soon, and all the buds left will break into wood, instead of being transformed into flower buds. The buds left may also break too soon during the current year, instead of the next. Shoots thus produced out of season cannot be ripened before winter, and immature wood makes the trees tender, and causes them to suffer from frost. Summer-prune too late, and the buds are not sufficiently filled before the end of the season. The best time is from the middle of June to the middle of July, according to the earliness or lateness of the season. The extent to prune back the young wood also requires skill and experience; for apples from four or eight buds may often be left on the young wood (Fig. 30). If the wood is weak, two or three buds may be sufficient; if strong, perhaps four or more buds had better be left.

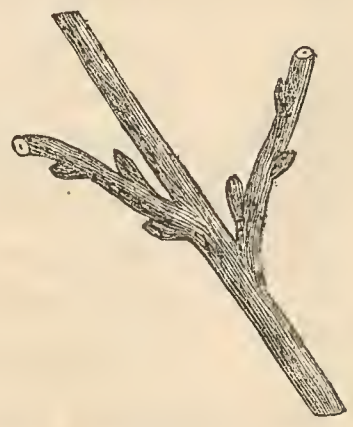

Fig. 30.

One summer's pruning should suffice; a second or more prunings or stoppings are to be avoided. These interfere too much with growth, and prevent alike buds and shoots from arriving at maturity. The leading branches are generally better without much summer pruning, unless in those cases in which no extension of growth is needed. When trees have attained full size, the leading or main shoots, as well as the side shoots or breast wood, may be summer-pruned. But when the trees are still to be enlarged in size, the leading shoots should not be summer-pruned, and this unchecked growth of part of the tree tends to augment its strength as well s enlarge its fertility.

III.—Winter Pruning.

Were summer pruning perfect, and carried far enough, little or no winter pruning would be needed, and the less the better. Winter pruning ought to be the shortest link of perfect pruning. It is impossible, however, to estimate growing force with sufficient exactness to regulate the extent of summer pruning required; therefore the amount is roughly guessed at, and the winter pruning removes any redundancy of wood left. (Fig. 31.) Sometimes, too, the fruiting spurs get too far from the leading branches, and should be cut back. (Figs. 32 and 33.) But beyond this, under a proper system of root and summer pruning, there will be little or no removal of wood. Winter pruning is, in fact, a mere removal of useless matter. It can change but little, and exerts no transforming force. It is useful at times in improving the form of trees (Figs. 34 and 35), and in producing shoots or branches where wanted.

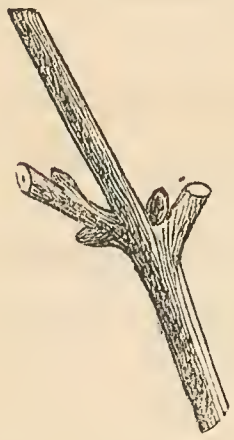

Fig. 31.

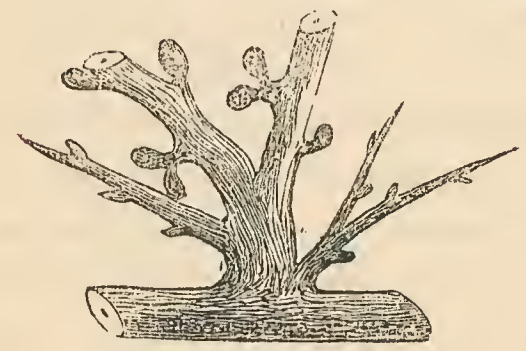

Fig. 32.

Occasionally, too, winter pruning becomes a means of reducing excessive fertility. Fruit buds may be thinned, fruit spurs removed, and in their stead wood may spring forth. This is occasionally one of the chief objects of winter pruning. When trees are weak and exhausted, as apple trees often are, by over-cropping and starvation, then severe winter pruning may revive their growth, flush them with sap, restore or re-establish their exhausted powers. But this belongs rather to cutting in or back than to mere pruning. How this operates to concentrate, and therefore restore force, is shown in Figs. 36 and 37. Trees well-nigh hopelessly weak are often thus again made strong.

Fig. 33.

But the greatest art of all pruning is to know when to stop. Masterly inactivity often demands far higher skill than the most dexterous use of the knife. Trees may be pruned into fertility and out of it, and the best remedy for excessive fruitfulness is not seldom a free use of the knife; but it is better to thin the crops down to moderate dimensions than have to prune trees out of excessive fertility. And with skilful pruning and a careful adjustment of the load of fruit to the strength of the trees, these will continue long in robust health and

Fig. 34.

Fig. 35.

full bearing, with but little pruning. Pruning, in fine, should be looked upon as an exceptional surgical operation, rather than as an every-day, matter-of-course affair. With higher skill it may become unnecessary, and at present winter pruning especially should be indulged in to as limited an extent as possible. It may be useful for limiting the number and shortening the length of fruiting spurs, for the shortening of leading shoots, for the removal of misplaced boughs, the thinning out of over-crowded branches, and the reduction of their numbers. In a word, we prune for fertility, symmetry, size, quality, and as an aid to perfect training rather than a substitute for it. By admitting more light

Fig. 36.

and air to all portions of the tree, its uniform strength and vigour are maintained. The whole produce, being fully exposed to light and air, is also almost all good alike. This uniformity of high quality in apples is worth all the labour involved in skilful pruning; and, as one of its results, perfection of form leaves an equality of like favourable conditions for all the fruit — a result impossible generally without pruning, and that of the most skilful sort.

The best time for winter pruning is from October to January. Immediately before or as soon after the fall of the leaf as possible the plant is in that state to heal wounds with greatest certainty and despatch. The descending sap is the great healer of breaches, and a cut made at the end

of October will be so far towards healing that the severe frost which mostly comes with the new year will do it but little harm. On no account should winter pruning be proceeded with during severe frost. The knife bruises and breaks rather than cuts frozen wood, and leaves wounds that are long in healing, if ever they do heal soundly. The cut should be clean and at a sharp angle, with its lower edge nearest to the bud, so that the new shoot or growth proceeding hence should the more speedily cover it with new wood. Very much of the success of pruning turns upon such minutiæ as the time and place to cut; and, in fact, in pruning nothing is too small or minute to claim and receive the

FIG. 37.

most careful attention. In horticulture generally, and pruning in particular, it is the master of trifles who commands success.

PLANTING.

I.—Time.

TIME, soil, and site, are the three most important points to consider in regard to apple planting. The best time to plant is from the middle of October to the end of December. No doubt apples will grow, even if planted up to May, or, in fact, at almost any time; but they will thrive

best and lose least time in looking behind them if planted at the season here recommended. The earth is then warm from the stored up summer and autumn sunshine, and the trees are assisted to re-establish themselves by the root renewing power of the descending sap. The roots are also in an abnormally active state in November. Trees moved at that season form fresh roots faster than at any other time. This is of the utmost importance, for the sooner the roots lay hold of the new soil the sooner is the tree safe. Roots unattached to the soil are in an unnatural and, consequently, dangerous state. Having nothing in particular to do, they may set about growing afresh, or they may also wither up, rot, and utterly perish. Set them to work earth boring, food collecting, or conveying, and they are comparatively safe. The shorter the interregnum to growth between the old quarters and the new the better for the well-being and safety of newly-planted trees; and hence to a large extent the success of November planting. The roots at this season make haste to run into the new soil, and, having done so, the safety and success of the newly-planted tree is insured.

II.—Soil.

The soil to plant in is of equal, or more, importance to the time to plant, though the apple can hardly be said to be fastidious about soils. It thrives more or less on all surface strata and on any geological formation, and, in fact, can be found in more or less robust health from Land's End to John o'Groat's. Yet it thrives best on the richest alluvial loams. On these, if of sufficient depth, the apple may be said to take care of itself. It grows with an energy, and fruits with a profusion and a quality, altogether unknown on thin, poor soils or heavy tenacious clays. On suitable soil the apple may be said to be free from disease. No canker eats into the heart of its stems or branches, no bug swells its boughs into gouty-like limbs, or weakens and shortens its life. No yellows destroy its healthy verdure, as often happens when the apple is planted in wet soils; no stunted growth cripples its energy, as when thrust into soils too poor to support its strength.

So important is soil to success that, where the natural soil is unsuitable, it should be supplemented with other and better before planting. It is almost better not to plant at all than to plant on unsuitable soils. The first point in the preparation of soils is to see that they are well drained. Stagnant water will ruin the finest soils in the world. Give the water a free exit at the bottom, and its passage through will improve all soils and render good loams even more perfect for apple culture. The mistake must not, however, be made of draining land twice. This is

injurious, and is often done. Because drainage is good for some lands, all are drained. It thus happens that soils lying on porous strata, already perhaps almost over-drained by nature, are injured by being drained again by art. Stagnant water must, however, be got rid of. It is disease or death to apple trees, and sure and certain disappointment to cultivators. As the soil should average from 18in. to 30in. in depth for apples, it follows that draining to be efficient should be from 3½ft. to 4ft. in depth. Shallow drains are of but little use in an orchard or apple garden, for not only will the roots bore beyond them and so reach wet soil, but they will also get into them, and so block and utterly ruin the drains, and render them, in fact, of no effect. This incessant seeking and finding of drains by the roots of trees is one of the most mysterious natural occurrences, which is fraught with stultifying results to the shallow drainer. On the other hand, however, deep drains are not found to draw the roots down to their destruction or to that of the tree. Placed a certain distance below the main roots, the latter keep near the surface, seemingly unconscious of the drains.

Having thoroughly drained the ground intended for the cultivation of apples, or at least carefully examined it to see if it needs artificial drainage, its quality will be revealed by either process. If of a light gravelly or sandy character, it may be much improved by clay, marl, strong burnt earth, and manure. Though rich loams would be injured for apple culture by the addition of manure, that is no reason why poor lands would not be improved by it. But the more durable constituents, such as clay, marl, &c., are more useful for changing light soils into earths heavy enough for apple culture. Occasionally trenching and carefully admixing the surface soil with a portion of the stiffer subsoil, will convert light lands into good soils for the apple. These strong earths give to light lands those binding and holding qualities so essential to the successful cultivation of most fruits. Heavy soils, again, may be ameliorated, lightened, and warmed by drainage, the addition of sand, lime, chalk, vegetable refuse, burnt earth, and other matters. But, where the soil approaches to sheer clay, it is often the cheapest course in the end to remove masses of it bodily in circular spaces, 6ft. or 9ft. in diameter and 2ft. deep, and replace the stiff tenacious clay with good rich loam from a neighbouring pasture. Loam can also be purchased at reasonable prices by those who have no pastures of their own, or manorial rights over waysides or commons. Where so much good soil cannot be had, it is well to give the trees a start if only a yard of good earth could be provided for each. By the time the roots reached the extremity of the artificial soil, the ameliorating influence here recommended would have gone far to render the most ungenial

and unsuitable soils fit for apple culture. Some contend that the nearer the surface the root can be kept the better for the health and the fertility of the trees. There is, no doubt, much truth in the statement, but it is not the whole truth. It is quite possible to have roots too shallow for the welfare of the trees. The character of the roots, much more than their place in the ground, determines their measure of useful work. During long spells of drought it is well to have roots so far removed from the surface as to run little or no risk of exhausting the supplies of food or moisture. It takes much of both to support an apple tree fully furnished with leaves and growing boughs, and heavily laden with fruit. It is at such times that deep, large, rich root runs reveal their importance. A deep soil is seldom injurious if it rests on a dry bottom. It is not depth but wet that causes late growths of wood and fruit in the autumn, and the maximum depth here recommended will not be found excessive to the successful cultivation of the apple for a series of years.

III.—Site.

The site is also important. Planters, however, have seldom a very extensive choice of sites. But natural sites may be improved as well as natural soils. Shelter alone will change a bad site into a good one. Neither is it needful to crowd the shelter right up against the apples. This is often done, to the robbery of their roots and the weakening of their tops. A shelter is often more efficient at the distance of 50 or 100 yards than close at hand. Apples like a warm, cosy spot, but hate to be overshadowed or overhung. Again, apples delight in a gentle slope, if it can be provided for them. This insures more thorough drainage and a warmer, more genial atmosphere. Apples should never, if it can be avoided, be planted in the bottom of a valley. That is the coldest place in the locality, and the spot where the spring and autumn frosts work most mischief among the apples. Gentle declivities to the east, south-east, south, south-west, west, are the sites best adapted for apple growing. On the whole, as the frosts now mostly run the severities of winter almost right through our fruit blooming season, a south-west or western aspect would be likely to insure more crops than any other. A site or aspect with any point of north in it is too cold for superior apples in all but the extreme southern counties. Some of the most successful orchards, it must also be admitted, have sloped to the east and caught the morning sun. Of course, too, thousands of tons of good apples are grown on the level, and have been planted and cultivated with little or no regard to site. Still, site is a point worthy of

consideration, and it is always worth while in planting apples, either in the garden or orchard, to give the trees the most favourable site that can be chosen for them.

IV.—Method of Planting.

Apples may be placed in the most favourite sites, planted at the right time and in the best soil, and may yet fail for lack of promptitude and skill in the act of planting. A tree out of the earth is like a fish out of water. Air is suffering, disease, and death to root and fish alike. But the root expresses no suffering, it can only dry and die. Hence it is often exposed for hours, while minutes are all too much for it. This arises from want of thought and due preparation. All borders should be made, holes dug out, stakes, ties, mulchings, &c., provided before any trees appear on the planting ground at all. If ordered from a nursery, special orders should be given concerning the covering and keeping moist of the roots on the journey. Excellent as are the packing arrangements in most nurseries, the roots not seldom get frozen or dried on the journey. When the trees arrive they should be immediately unpacked under cover or in a sheltered spot. Especially should these precautions be taken should the air be harsh, dry, or frosty. If the roots are found dry, they should at once be sprinkled, or plunged into water. Each tree ought then to be carefully examined, bruised roots cut clean off back beyond the bruise, and strong ones also pruned in if needful. In all these processes every care must be taken to preserve the fibrous roots. If the ground is near, each tree should be planted as soon as examined and trimmed. Should the orchard or garden be a considerable distance off, the trees may be laid on hand carts or barrows, and their roots protected from sun, wind and air on transit to their growing ground.

The bottom of the holes for the trees should be made level, smooth, and somewhat hard. The roots are thus displayed horizontally, which gives them a fair start towards the best and most genial soil. An irregular or uneven soft base for the roots is apt to tempt them downward, and the pressure of the covering earth may readily rupture tender roots displayed on a rough uneven surface.

It also greatly facilitates the planting if a stake proportioned in strength to the size of the tree is placed in the centre of each hole as soon as formed. The tree is then set down and looped on to the stake with a loose tie, which leaves both hands of the planter at liberty to attend to the regular and systematic display of the roots. It is asto-

nishing how systematic attention to these minute matters forwards the planting of apple and other trees, and helps and perfects the process, which is rather a trying one to novices in horticulture. Where a number of trees are to be planted, it is a good plan to partially plant all before finishing any.

As soon as the roots are thoroughly covered over with soil the tree is out of danger. The levelling in of all the earth, smoothing the surface, and other final processes of planting, may then be proceeded with more leisurely. It used to be a common practice to tread the trees in. This is a dangerous practice. No one hardly would think of treading over exposed roots, and it does not mend the matter much though these roots be covered over with a thin layer of earth. The mischief is hidden, but the treading ruptures the roots all the same. The weight of the soil, followed by the winter's rains and snow, consolidates the roots sufficiently without treading them in. Others, again, flood the roots home. This means something more than a common watering. It is, in fact, to drench the earth till it becomes something like mud, and the soil in this wet state settles down around the roots and holds them firm. This is very useful for late planting, but is seldom necessary for the planting of apple trees in November. Secure the tree to a stake, plant it sufficiently deep, cover the roots with fine soil, and leave time and weather to do the rest.

The question of depth to plant is rather a vexed one, and may be considered as of vital importance. As in most matters, so in the planting of apples, a medium depth is best. With the roots all on the surface growth is weak and life mostly short. Roots running too deep result in huge boughs and sterility. Practically, too, most trees decide the proper depth for themselves. However trees are raised, whether from seeds, cuttings, grafts, buds, or layers, they speedily reveal a ground line or collar, all above which is stem, all below roots. This line can only be altered at the peril of cultivators. Raise it higher out of the earth than nature intended, and you unduly and injuriously check growth; sink lower, and you invite disease and kill the plant. The planter has only to observe the natural ground line and plant up to it, and he is sure to be right; ignore it—bury it or hoist it up into the air—and the tree suffers in the ratio of the interference with the collar of the plant. Cover apple roots at planting time with from 6in. to 9in. of soil, and the majority of them will be found permanently within a range of 6in. to 24in. of the surface.

Starting from a level base, the roots will have little inducement to bore into the subsoil. Many of the older practitioners erred in raising the base of the root run in the centre; they were anxious to keep up the

bole of the tree and its main roots. These were set on a hillock in the centre of the root run, and all the roots ran down hill towards the sides of the hole; the consequence was that all the best roots made immediately for the subsoil.

To counteract this, others reversed the form of the base line for the roots. The centre of the tree was placed lowest, and the horizontal roots led up hill. This resulted in bringing the best roots too close to the surface. There is no form for the base equal to a level line. The roots then stand in the exact direction where they will find the most and best food. If care is taken, too, to bury them in layers separated by a few inches of earth between, much overcrowding and useless matting together of the roots is avoided. Roots feed best, not in huge matted masses, but in solitary isolation.

It is also important that the holes be large enough. Many attribute much importance to the form of the holes, some cultivators preferring round, others elliptical, square, or other shaped holes. The form is of no moment, provided the hole at all points is a foot or so wider than the sweep of the roots. In stiff soils 2ft. wider than the longest root would be better still. It is important that each root should find loose soil ahead of it, so that it may penetrate it easily, and not be bent back upon itself by meeting with hard and unbroken soil.

When it is found impossible to plant early in winter, and the trees to be planted were grown in a warm soil in a warm situation, it may at times be desirable to remove them thence in November, and inlay the trees by the heels behind a north wall till the new quarters in garden or orchard are ready for them. This practice, however, is recommended as a choice of the lesser of two evils. But, if apples must be planted as late as March, and the trees are moved from warm and forward nursery lines, they will suffer more than they would by the double removal.

After planting, whether early or late, the surface of the ground should be rendered frost and drought proof by a covering of some non-conducting material, such as stable litter, moss, cocoa-fibre refuse, or spent tan. This prevents the roots being arrested in their growth, either in summer or in winter—a point of immense importance to all roots under all circumstances, but, of course, specially so to those that have been newly planted, and that, consequently, have to make sure of their new hold of the ground, as well as to supply all the demands of the tops of the trees for food. This mulching, as it is called, of newly-planted trees is one of the most important points in modern culture, and exhibits a striking advance on the older and rougher expedients. But when all roots were buried deeper in the earth there was less necessity for mulching, as the earth itself protected the roots from the severities alike

of frost and drought. As we bring the roots nearer to the surface, it is of the more importance that they should be protected by a super covering, to protect them from the extreme vicissitudes of climate.

The distance apart to plant apple trees must be determined by the size of the trees, the conditions of soil, site, climate, habit, and the object of the cultivator. The distances may range from 2ft. to 40ft. The first may not be too close for oblique cordons, and the latter may not be too much for permanent orchard trees on good soils. Much also turns on the habit of different varieties. Such wide-spreading sorts as the Nonsuch and Beefing require a far wider area than the closer-growing varieties, such as most of the codlins and pippins. Hence, even orchard trees may have a wide range of distance, from 15ft. to 40ft. Soil and climate must also be allowed for. Taking 40ft. as the maximum distance for orchard trees on good soils, 20ft. would be ample on thin and poor soils. It is also good practice, and pays well, to plant supernumeraries. to be cut out after a few crops to make room for the permanent trees. Hence most orchards are planted at first with about three times the number of trees that are to remain permanently; that is, every other row and every other tree are cut out as the space is required by the permanent trees. The distance between pyramids, again, may range from 5ft. to 15ft., according to their sizes; and similar distances will be found useful for bush trees.

Horizontal cordons may be planted from a yard to 4ft. or 5ft. apart, and it is a good plan to graft the heads of one tree into the root end of the other, when it reaches it, thus making a continuous and self-supporting rope of fruit from one end of the line to the other. Oblique and diamond cordons may be planted as closely as from 15in. to 30in.

In general terms, it may be stated that the better the soil and the more favourable the climate the wider apart for all sorts of trees; the worse the soil and the more ungenial the climate, the closer should they be planted.

CROPPING.

I.—Thinning.

MANY crops of apples are wrecked between the setting of the fruit and the time they reach the kitchen or dessert. Overloading is the cause of full half the apple failures one sees or hears of. In favourable springs almost each blossom sets and each apple tries to grow into full size.

But being too thickly arranged in clusters to allow of this, and being also far too numerous for the resources of the tree, the result is a host of small apples little superior in size to crabs, instead of handsome, full-sized samples. The tree can neither furnish area enough nor strength sufficient for so many apples, hence the whole are of necessity dwarfed. Neither does the evil end here. An overcrop one year exhausts the strength of the tree and leaves no residuum of fruit-bearing force for the next. Hence seasons of scarcity alternate with seasons of plenty and a heavy crop is, as a rule, succeeded by one or more years of scant supplies. By judicious thinning we do much, notwithstanding our capricious climate, to obtain the most useful desideratum of households, an annual crop. The fruit is also much finer when the crop is thinned; and, weight being equal, fine fruit is far more profitable to eat or cook than small. The percentage of rind and waste inside is so much less in fine fruit. Besides, large fruit are so much more handsome in appearance and easier to use and prepare for use than small. But weight as well as size must be taken into account, otherwise it would be easy to overcrop apple trees with large fruit. The weight of these is, in fact, very deceptive, and ten large fruits will often be found to have as great, or even a greater, weight than a hundred smaller ones, though the latter make by far the greater show. The judicious thinner will apportion the load to the size of the trees. The tree started with a load far beyond its strength often drops them all before any reach maturity. Few things are more trying than having the ground strewn with useless apples throughout the season. This continual dropping of small and quite useless fruit is simply Nature's way of thinning. She sacrifices a crop to save the tree. The cultivator, by thinning his fruit in time and to sufficient extent, would have saved both.

II.—Swelling.

Properly thinned, it may be thought that apples would swell without further trouble, still they may be assisted much in this important matter. The trees should be well fed and carefully watered, if needful, during the swelling period. The difference in the sizes of apples in different localities is mainly a matter of scarce or plentiful supplies. Allow the roots of apples once to become dry during the swelling of the crop, and the fruit will be the smaller in consequence. Attention to water is most important in the case of small trees. Large orchard or other trees have their roots running deep and wide. Hence, if one part of their root run is dry, another is likely to be sufficiently moist to supply

the wants of the fast swelling apples. But in the case of cordons, pyramids, and bushes the roots are often cramped into small areas, and also kept very near to the surface. The drought speedily tells upon them and cuts off their supplies, and the fruits are arrested in growth. These forcible stoppages for lack of water not only lessen size, but lower quality. They are a chief cause of grittiness and largeness and hardness of core. It is therefore most important to water apples during dry weather; house sewage or other manure water is admirably adapted for this purpose, the roots being thus simultaneously watered and fed. It is also good practice to sprinkle the swelling apples overhead on the evenings of bright days. This is easily done in the case of small trees or choice apples on espaliers or walls. In cases, too, where a water main passes near to an orchard, a hydrant, hose, and spreader would speedily give all the apple trees a most invigorating cleansing shower, which would help the small apples to swell fast into large ones. A powerful garden engine would reach to the tops of most apple trees, and would pay as a preventive or remover of insects during droughts, as well as promote the swelling of the fruit.

But the roots should be fed as well as watered during the swelling of the apple crop. Nothing is so useful for this as a mulching of good dung on the surface of the soil. From 3in. to 6in. of sheep's, pigs', or cows' manure spread over the surface of the roots of apples—the strength being watered in either by the rains or artificially—will swell off the crop to full size better than any other prescription whatever. Of course, apples planted on good rich soils will swell off many a crop to creditable dimensions in average seasons without any such extraneous aids to growth. But on poor soils, and in the case of small trees heavily laden with fruit, or in others where the utmost limits of size attainable by varieties is desiderated, these root and overhead waterings and manurial mulchings will be found of the highest service.

III.—Ripening.

The ripening of the crop must be accomplished by the tree and the weather. The cultivator may hinder, but do little to help, it. From the time fruit reaches full size, all stimulating treatment, such as recommended during the swelling period, must cease, and unless the drought should be unusually severe, no water must be applied to the roots. Should the leaves overlie the fruit very much, a few of them might be removed. Occasionally, too, the breast or young wood, if stopped too early in the season, may have made a second growth, which may partly

overshadow the ripening fruit. When this happens the young wood may be removed, and some of the leaves also. This defoliation, however, must by no means be carried to excess, and is, in fact, seldom necessary. Unless performed with much skill and care, it had better be let alone. Neither must the leaves be removed at all unless they are nearly ripe, and the buds in the axils full and plump ; for unless this is the case, our attempts to ripen more perfectly the fruit of one season would but ruin the crop for the next.

During dull, cold seasons, too, various expedients may be used to hasten the ripening of apples on small trees. Tiles or slates are sometimes placed under horizontal cordons, to reflect back more heat on to the fruit. Plantations of dwarf, bush, or pyramidal trees are cleared of ground crops and raked smooth, so as to throw back more heat. Arable orchards are also more favourable to early and perfect maturity than those on grass. Glass lights or frames are also at times used to place over Ribston Pippins, Nonpareils, and other choice apples on walls in cold seasons or northern latitudes. But in general the cultivator attempts but little in the way of direct efforts towards ripening the apple crop. He is careful, as we have seen, to choose favourable sites and situations ; to plant sorts suitable to his locality in the best soil he can command, and then he trusts to the seasons to ripen his crops sufficiently for gathering.

There is, however, a wide distinction—often lost sight of by amateurs —between fruit ripe enough to gather and fit to eat. It is only in the case of a very few varieties that the two terms are synonymous. Most of our finest apples should be gathered long before they are fit for table. The ripening goes on, and is consummated, it may be, months after the fruit is detached from the trees. Ripening is, in fact, as much, or more, a chemical than a vital process. It is a thing of many stages or degrees. There is a stage of ripeness which is the best for gathering, another the choicest for eating, and others beyond that, and yet others again, until maturity merges into mellowness, and finally runs into rottenness.

IV.—Gathering.

How can the cultivator know when to gather his apples ? Chiefly by experience. The earlier varieties drop as soon as ripe. They alone ripen up to the eatable stage on the tree. Eye, nose, palate, touch, all tell us they are ripe. But late sorts give little or no sign. It is also quite impossible to construct a time table for the gathering of different varieties. The difference of a few miles—sometimes often of only a few

yards—or a mere change of site or inclination of ground may make a difference of a month or more in the time of gathering. Again, seasons vary from each other often as much as a month or six weeks in their earliness or lateness. Neither do appearances help the cultivator much in regard to the time to gather late fruit. Some sorts do reveal maturity by certain changes of colour or degrees of semi-transparency; but it needs much experience to read these signs of ripeness, and they also vary much with seasons, and are at times altogether hidden or wanting. How, then, shall the amateur know when to gather his apples? Chiefly by three simple tests within easy reach of all. The apples will begin to fall of their own accord; their seeds will be plump and brown in colour; and the fruits will separate with a mere touch from the trees, without removing either leaves or buds with them. The first test is not always to be trusted. Some seasons a great proportion of a crop may fall before the apples are really fit to gather. It may do so from overcropping; from weakness or disease of the tree; from insects in the fruit; from sudden checks, or other causes. Therefore, when apples begin to drop it is well to apply the seed and other tests before gathering the main crop. Experience, however, will soon teach growers whether the crop is dropping from accidental causes, or from ripeness.

The seed test is also a pretty safe criterion. All that is needful is to halve a few apples with the knife and test the seed. The hardness and colour together form sure symbols of maturity. The seed may be large, and brown also; but unless they cut rather hard, and seem mature and almost free from juice when cut across, the probability is that the apples are not fit to gather. The last test is the surest and most infallible one. If the connection between the fruit and the tree, the fruit stalk and the buds near its base is so slight that it can be severed by the merest touch, then the crop may be gathered with confidence, for the connection between it and the tree is already virtually severed. The lines of communication being so weak, the apple can draw no more strength and support along them, and therefore may be safely separated from the tree at once. However, it is not always possible to wait until the trees thus dismiss the fruit into the gatherer's hand, and in late seasons another test may sometimes be employed with great practical advantage. The fruit may be suddenly lifted up to form almost a right angle with its line of growth. If it then comes off readily, it may be gathered, if not it may be left to hang as late as is safe for fear of the frost. All apples should be gathered before the end of October, for none will bear frost with impunity. A few degrees of frost may not cause decomposition, but is fatal to the flavour of apples, and should never be allowed to touch them.

Apples, however, should be left on the trees as late as may be in safety until they prove fit for gathering by the simple tests here given. It is almost better to leave them too late than to gather them too soon. In the latter case their beauty is quickly marred by irrevocable shrivelling which also lowers their quality and destroys their flavour.

The mode of gathering apples is hardly of secondary moment to the time. They should be gathered in dry weather, and handled as gently as if they were balls of blown glass. It is not always possible to gather apples dry, and some contend that they keep equally well when laid up wet. Others, again, recommend them to be spread out to dry before being placed in store. The injury of frequent removals is so great that, when gathered wet, as the least of two evils they had better be stored wet. The rubbing of apples dry, or drying and a second removal, would injure them more than the little wet that would adhere to their smooth surface in store. But always, when possible, they should be gathered in a dry state in fine weather. They are less easily injured when gathered dry, and also keep better. It is impossible to go to extremes in the matter of gentle handling in gathering. Could each fruit be touched softly and laid singly on a soft, elastic base, there would be few complaints of imperfect keeping. All choice applies should be gathered carefully and laid gently in baskets or trays in single file only, and so conveyed to the store room. If anyone wants to know how *not* to have his apples keep, here is a sure recipe: Shake the fruit from the tree to the ground, gather it up into deep baskets or wheelbarrows, convey it roughly to the fruit room, and then pitch it up on to the shelves. Full half of it will have rotted within the first two months.

V.—Storing.

There is an almost endless diversity of modes for storing apples. Some recommend casks, others boxes, jars, flower pots, pits in the earth, &c. The packing material prescribed is as various as the methods of storing—sand, sawdust, dry earth, charcoal, paper, shavings, moss, chaff, cotton wool, malt coombs, hay, straw, &c. Every variety of place, from highest garret to the lowest cellar or cave, has also been recommended for storing apples. It must also be admitted that all the places, methods, and accompaniments have proved more or less successful. It may, however, be stated that the simplest way is the best, and perhaps there is no simpler method than the choosing or forming some room or place, free from all extremes of heat and cold, dryness or damp, where a temperature as near 45° as may be is maintained for the apples. A plan of a fruit

room will be found in the succeeding treatise on pears. Meanwhile it may be observed that a steady temperature is the chief consideration. Some make much of a circulation of air. This is by no means important. On the contrary, it is likely to be injurious. The fruit, too, is best laid on wooden shelves. These should be made of poplar, sycamore, lime, or other white wood. Deal, oak, ash, elm, and almost all other woods give a taste to the fruit. Nothing should be laid under the fruit, unless it be a few sheets of tissue paper. Hay, straw, and such substances are injurious, and almost sure to flavour the fruit, and induce mustiness and hasten decomposition. Neither should apples be covered over above, any more than padded below. They ripen best, and are of the highest flavour, when left fully exposed to the free atmosphere of the fruit room or store. The light should also be shut out. Exposed to light, apples ripen sooner, and also develope a stronger tendency to shrivel. A more even temperature is also possible with the light shut out. Apples gathered at the proper time and stored in the right way finish best without any external help. They have all the elements of the highest quality within themselves, which they will be sure to develope if time only is given to them.

In storing apples, too, a careful selection should be made between late and early varieties. If these could be stored in separate places it would be desirable to do so; if not, they should be placed as far apart as possible. For ripeness and rottenness also seem rather catching. Good keepers seem to be partially affected by the bad, while decomposing apples are positively infectious to sound ones, therefore the decayed fruit should be constantly removed, and early and ripe sorts be kept as far from the sound and long keeping varieties as possible. The classification of fruit at storing saves time as well as assists good and long keeping, and can hardly be too carefully attended to. All inferior or injured fruit should also be stored by itself. Few things give more trouble or mar the appearance of fruit stores more than the packing away of inferior fruit with the best, and the placing of small, pecked, or bruised specimens with those that are sound and perfect. The plan of isolating each fruit by packing in tissue paper, sand, burnt earth, or other substances, though favourable to long keeping by excluding the air, also injures and often entirely destroys the flavour of fruit, for the air seems essential to the perfect maturation of apples after they are gathered.

Stored on latticed shelves in single files, looked over occasionally to remove any specked fruit, each variety will keep its appointed time without further trouble. That time, however, varies according to seasons, and is seldom according to times given in fruit lists or catalogues. Each fruit has, in fact, a wide range of season according to

season, soil, local climate, modes of culture, temperature of fruit store, and other influences. It is, therefore, important to have an eye on the fruit store, and to occasionally test the varieties so as to catch them at the right time for table or kitchen use. Used too soon, apples are too acid; kept too long, they degenerate into sleepy mealiness, and have lost all their sparkling briskness and delicious aroma and freshness for which they are mostly valued. Apples should neither be handled nor rubbed in store. These but tend to hasten decay and mar their beauty. In a regular temperature the fruit will seldom sweat, and if it should, from extreme atmospheric changes, it should be left to dry again of its own accord.

VI.—Serving.

The last point to be noted now is the serving or use of apples. In regard to kitchen apples, it is practically too often forgotten that each variety has its proper season for use, as well as dessert sorts have their appointed time for table. By paying attention to use each cooking apple in proper season, not only will all its best qualities be developed in tart, pie, fritter, sauce, or what not, but an immense saving of sugar will be effected. The majority of kitchen apples have almost sugar enough in them to eat pleasantly without any addition if only kept till their proper season. But cooked, as they often are, in a hard, green condition, they are sour as crabs, and have no particular flavour but intense acidity. Many apples are also utterly spoilt by an excess of sugar. The way to thoroughly enjoy good cooked apples is to use no sugar until they come to table, when each person may sweeten to his taste. The question has lately been mooted whether it is worth while to grow many kitchen apples at all; a few of them may be almost indispensable for sauce. But as they take up the same room and can hardly be said upon the whole to be more productive than dessert varieties, and as the latter, moreover, are far superior cooked to the sub-acid sorts, it may be wise to use chiefly dessert varieties for kitchen purposes, and thus, at least, save or reduce our sugar bills.

Dessert apples, unless served at the proper time, are nothing. They should be carried from the fruit room to the dessert table in flat baskets only one apple thick. Should the distance be great and the weather frosty, the fruit should be covered over with a layer of cotton wool in transit. A mere sting of the frost in passing injures the flavour of apples. The best way of serving up apples for table would be in single file. But custom builds them up in the form of a pyramid of three or four layers, tapering to a single fruit in the centre. They are

generally dished up with vine or other leaves. Some, however, use coloured paper. Different coloured leaves, such as those of such vines as the Claret, Barbarossa, West St. Peters, are among the most striking. The Liquid Amber and Virginian creeper also brighten up the yellow or orange varieties of apples nicely. For the red-cheeked sorts leaves of the variegated *Cobea scandens*, *Acer negunda variegata*, or silver variegated kale, afford a nice contrast. Extra curled parsley, tansy leaves, asparagus tops, and other elegant foliage, such as maiden-hair or other ferns, some of the finer lycopodiums, &c., give grace and beauty to dishes of apples on the dessert table. Some of these garnishes are, however, objectionable, on account of their scent, or the flavour they impart to the fruit, and ivy and even laurel leaves are objectionable on the same grounds. There are few more effective dressings for apples than that of leaves and tiny branchlets of holly, either with or without berries. Among the wide choice of green and variegated hollies, sufficient variety may be found to suit every coloured apple, and the holly neither scents nor flavours the fruit. Brought to table at the right time, and disposed to the best effect, there are few fruits more prized for dessert than first-rate apples, which might be eaten by every-one, if not absolutely all the year round, at least nine months out of the twelve.

Diseases and Insect Pests.

The apple grown on good soil and skilfully cultivated is but little attacked by disease, and seldom seriously infested by insects. Both alike are generally proofs of something wrong, either in the soil, the climate, or the management. With these three what they ought to be, most apples are proof against disease, and afford but little shelter or food for insect pests. But as climate is beyond control, and apples are often planted in ungenial soils, disease frequently breaks out among appies alike in garden and orchard.

I.—Canker.

The most destructive and most difficult to prevent or cure is canker. This is something akin to cancer in the animal kingdom—a something that eats in to the tissues, consumes or dries them up, and so kills large branches or main stems. It first blotches and kills the bark,

arresting the proper passage of fluids, then eats its way into the wood, and finally utterly destroys the affected parts. There can hardly be a doubt that the seat of canker is generally in the soil. The roots either absorb or touch something deleterious to the tree, and there is a stoppage or derangement of fluid, and perhaps a deposit of granular matter, and canker results. A change of soil, or rather the uplifting of the roots into new and different and warmer earth nearer to the surface, is generally the best remedy for canker; and this is the sooner effected if the cankered parts are reduced and dressed with oil or other oleaginous compound.

Excessive growth may also produce canker, especially if it is prolonged late in the season. Gross wood hit by the frost before it is matured results in a sort of canker, very similar to that produced by a mere mechanical bruise or abrasion. The cold ruptures the cells when full of sap, and this immature wood becomes blotched and cankered. This sometimes happens on the best of soils, and especially in low-lying localities. When apples are grown in these care should be taken by root pruning, surface planting, and other expedients to check growth and hasten its maturity before the frost comes upon it.

Another cause of canker is severe and careless pruning. It should never be forgotten that all pruning is unnatural, and, therefore, that as few wounds as possible should be made, and these of the smallest area. The fluid or sap of plants is apt to ooze out of all the fresh wounds made; and such diversions of sap not seldom form the nucleus of canker and other diseases. The mere interruption and accumulation of fluids in places where there is no outlet for them, one of the necessary results of pruning, often leads to gangrene or canker. The concentrated sap seems to undergo a species of decomposition and canker—that is, decayed, dying, or dead tissues of wood—is the result. All pruning should be done as early in the life of stems and branches as possible. Pruning should also be done chiefly in the growing season, so that the wounds made may be quickly healed, and not left long in a raw state with the risk of degenerating into canker. Sudden changes of temperature, great extremes of dryness or moisture, and severe checks or arrestments of growth are also frequent producing causes of canker.

During severe drought, the roots of apples often become parched, the sap almost viscid, the bark what is known as hide bound. Suddenly a rainy season sets in, the plants are flushed with sap, the vessels, being so long scantily filled, either burst or are disgorged, and canker follows. It is also possible that canker arises at times from American blight, scale, or other insect agencies. These injure or destroy the bark and woody tissue, there is a derangement of fluids, and canker is established.

In a word, canker comes through many channels, the chief of which are doubtless an unsuitable soil, an ungenial climate, extreme and sudden changes of condition, unseasonable frosts, and insect pests. It may generally be prevented, seldom wholly cured. The favourite remedy used to be to cut out canker; and to some extent the remedy was successful. The strong growths that followed severe prunings continued free for a time, but they generally succumbed to canker in the end. At times canker seems developed from the action of lichens on the stems or branches. In such cases a thorough cleansing and a smearing of quick lime made into a wash proves useful. A wash of strong tobacco water or a weak solution of sulphuric acid is also fatal to lichens and mosses, and, so far as they destroy the latter, prevent canker originating in that way. But, in general, canker may be almost held to be incurable, and the best and safest course is to avoid, as far as possible, every producing cause of this troublesome and, some hold, infectious disease.

II.—Mildew.

Mildew, even more than canker, is a proof of an ungenial site or mismanagement somewhere. A wet soil or subsoil, an excess of manure, a deficiency or an excess of water, or any sudden check, will also, at times, produce mildew. Overcropping by exhausting the trees also sometimes invites or aggravates this troublesome disease. Sulphur dressings, or dredgings with equal parts quick lime and dry sulphur are useful checks to the ravages of mildew; but drainage, a renewal of the soil, or surface planting on raised hillocks, or an entire change of site are the only radical cures.

III.—American Blight.

The American blight is both a disease and an insect pestof the very worst description. This is at once the most mischievous and difficult to eradicate of all apple pests. It attacks the tree at all points, root and branch—strong trunk or delicate twig—gnarled bark and juiciest young wood—no part, above or below ground, is safe from the ravages of the American blight. It resembles at first sight a short tuft of fine cotton wool, slender as finest threads, laid into the crevices of the bark, or arranged in tufts around the buds or gnarled knots on the stem. On examination it is found that these flowing filaments are but the external fringes of hosts of wingless insects that prey upon the juices of the tree, and, in consequence, produce gouty-like excrescences on root and branch that destroy their tissues, and not seldom sacrifice

the life of the apple trees. One of the simplest remedies is to touch each white thread or solitary insect with turpentine the moment one is seen. This destroys them at once. So will pure spirits of wine. And neither of these applications will injure apple trees in a dormant state. Train oil also smothers the insects, and destroys and deranges their filamentaceous appendages, so as to render them harmless if not quite destroyed. Tobacco water also destroys them, if applied sufficiently strong; as also do solutions of carbolic and sulphuric acids. Benzoline, paraffin, petroleum, and other mineral oils also penetrate and kill the blight; but these must only be applied to the infected parts, as they are apt, when used neat, to blister the bark, and so lay the foundation of canker. One of the cheapest and most effective remedies is the ammoniacal liquor from the gasworks; but as this varies immensely in strength, it is peculiarly dangerous in use without some means of testing its power. Of ordinary strength, it may be applied to the infected parts only. Reduced with equal or more parts of water, the trees may be brushed over with it immediately after the fall of the leaf with advantage. At that season the buds are hard, small, and dormant. Later on the liquor would penetrate and destroy them. Boiling water is also a certain cure, but, of course, must be confined to the pests.

Smears of almost any kind are also useful, as they smother the insects in. They are generally, however, made nauseous or poisonous, or both, so as to give them a compound power. Hence the use of lime, cowdung, soot, with tobacco water, sulphur, nux vomica, soda, soap, turpentine, grease, oils, &c., as component parts of paints and smears. As far as the mechanical action of such kill the pests, adhesive clay or cowdung and water made to a thick paste are as effective as any. But add tobacco, turps, ammoniacal liquor, oils, soap, soda, to convert soot, sulphur, lime, &c., into paint, and the mixture is poisonous as well as suffocating. But the great difficulty with all these remedies is to apply them all over large or orchard trees, and it must, therefore, be confessed that they are more useful in gardens than in orchards. For the latter, and also for large trees in gardens, there is no remedy for American blight equal to the cold water cure. Applied with sufficient force and frequency, the pest cannot long stand against well-directed streams of cold water from the hose of a water main or the distribution of a powerful garden engine. This dashes the filaments to atoms, and these seem not merely useless ornaments but an essential part of the insect's life. It seems unable to live to any destructive purpose when these are washed off or persistently smashed into masses by a powerful stream of water.

For the cure of the blight on the roots water is also the only remedy.

Dryness originates, or, at least, invites it there, and, fortunately, it can be watered out. In bad cases, the affected roots, which are generally near the surface, should be uncovered, the blight washed off with soap and water, the roots dressed with train oil, the old soil removed and burned, new and clean applied, and then the entire root mass soaked with strong sewage, and kept more than usually wet until there is an end of the blight.

IV.—Scale and Aphis.

The Mussel, or brown scale, also frequently attacks the apple; it clings to the bark so closely, and is so like it in colour, that in a small state it often escapes detection. It injures the tree by feeding on the bark, and prevents the latter from performing its proper functions or continuing in good health. A common plan of removing the scale is to scrub it off with hot soap and water or paint the trees with lime wash, and so smother it in, or suffocate it with a dressing of train oil. Benzoline and other mineral oils have also proved effective in killing the scale. All young trees should be carefully examined for scale, &c., before planting, as it is obvious that few of those remedies could be applied to large orchard trees, however effectual they might be for the smaller trees of the garden.

The common aphides occasionally attack the apple in such numbers as to prove very injurious. Their chief point of attack is often the extremities of the growing shoots, and if this happens late in the season, say in the middle of June, the simplest remedy is to cut off the whole of the ends on which the aphides cluster, and carry them away in baskets to be burned. If the aphides attack earlier in the season the garden engine, with either clean or tobacco water, or hot sewage at a temperature of 130°, is the best remedy.

V.—Caterpillars, Weevils, and Maggots.

Various caterpillars and grubs also feed upon the leaves, flowers, and young fruit of the apples. It would unduly burden these pages with entomological matter to describe them all or prescribe remedies for each. Most of them are large enough to be seen by the cultivator, and every opportunity should be taken to pick them off, either in the moth, caterpillar, grub, or chrysalis state. All webs should be picked off apple trees as soon as seen. The trees should frequently be shaken, and any grubs or caterpillars that fall to the ground should be instantly destroyed. Trees that suffer from the apple borer or other insects should also have

a few inches of the soil removed from the roots in the winter, and fresh earth applied in its stead. It is also a good plan to surface round the stems and roots with wood ashes, cement, burnt earth, and tanners' bark fresh out of the steep. The latter proves fatal to most of the moths, caterpillars, or weevils that prey on the wood, bark, leaves, or fruit of the apple. Hand picking, thrusting an iron pin into their holes, plastering them in with nauseous or poisonous compounds are among the best remedies for the stem boring weevil (*Rhynchites alliariæ*), the caterpillar of the goat moth (*Cossus ligniperda*), the apple borer (*Saperda bivittata*), the caterpillar of the winter moth (*Hybernia brumata*), and many others.

The apple weevil that does most mischief, though there are several of them, is perhaps the one known to entomologists as the *Anthonomons pomorum*. This beetle, having slept in the ground or in a crevice of the bark throughout the winter, comes forth in the spring, just as the apples are in bloom, and hastens to deposit an egg in each flower bud. This egg is soon hatched into a small white grub, which eats up all the vital organs of the flower, fattens upon the future apple, and as soon as it has totally destroyed it, it is transformed into a beetle, strong enough to digest stronger food. Henceforth it preys on the leaves of the tree till autumn. At the fall of the leaf it either drops to the ground and hides away in the earth, or finds a winter's shelter in the bark till next spring, when eggs are again laid in each flower bud and another crop destroyed. From this account of the life of the apple weevil it will be obvious that the white grubs may be squashed as they feast on the tender flowers, and that the cleaner and smoother the trees are kept the less storage for the weevil. Scrubbings and smearings will also clear off a good many, and surfacings of tan would possibly either kill the weevil or bother them to get through in the spring. It will also be obvious that by removing a few inches of the surface soil bodily and burning it, it would probably go hard with most of the weevils and other pests which had sought safe winter quarters under the sheltering boughs of the leafless apple trees.

The apple maggot or codling moth (*Carpocampa pomonella*) is the most destructive and provoking of all apple pests. It is bad enough to have the shoots eaten through by stem-boring weevils, the flowers devoured by the apple weevil, and the wood tunnelled in all directions by the wood leopard moth and apple borer; but it is even more tantalising to have the apples bored through by the above and other maggots after they reach a promising size. The moth of the apple maggot generally deposits its eggs in the eye of the apple, or near the stalk. Either place is chosen according to the position of the apple

and either suits the insect equally well. There is a hollow to receive the eggs, and the skin of the apple is thinner near the stalk or the eye than on either of its sides. In a few days the eggs hatch, and bring forth white grubs. These instantly bore their way into the fruit, and feed upon their substance for three weeks or a month. After a time the grub, enlarging in size and growing in strength, eats its way into the centre of the apple. Here it finds more space and a change of food. From the time it reaches the core of the apple the maggot turns its attention to the seeds, and consumes them. No sooner does this happen than the apple, recognising that the purpose for which it was swelling and ripening its seeds has been frustrated, loses its hold of the tree, and falls to the ground. This exactly suits the design of the maggot, which, on the destruction of the seeds, at once begins to eat another tunnel, or enlarges one previously made, out of the fruit. Finding this already fallen, it creeps along the ground until it reaches the bole of the tree, in a crevice of which it securely hides itself until it passes from a grub into a chrysalis, and sleeps soundly until next spring, when it awakes to find itself a beautiful moth to lay its eggs, and begins the course of destruction so well known to apple growers. Perhaps the best mode of destroying these maggots is to collect and burn or otherwise destroy every apple that falls prematurely, or better still to examine the apples on the trees, and wherever the smallest sign of aperture is visible, gather and destroy the fruit at once. If allowed to fall the grub may make its escape before the fruit can be picked up. But if the affected apples are picked off the trees, the maggot will at that time be feasting on the seeds and has not yet tunnelled an aperture large enough for its escape.

Various traps have been recommended to decoy the grubs to their capture and speedy despatch on their way from the fallen apples to a hiding place. The simplest of these is to twist a few hay bands or pieces of old cloth, or fix laths of wood against hoops round the trees. The maggots, exhausted by the least effort after leaving the fruit, gladly rest in the first shelter they find, and thus if the traps are examined every second day or so many of them may be found lurking between the decoys and the bark, where they may readily be destroyed. A thick smear of lime or soft soap and grease on the boles of the trees also hinders the maggot from climbing them or transfixes them on the spot.

Some also recommend catching the moths in the spring, but this is slow and difficult work. It is a good plan, however, to collect heaps of wood, green spray, and other rubbish, and to light and maintain fires for several days, at different seasons, when the different moths show

in orchards. Smothered fires spread abroad huge clouds of smoke and ward the moths off, besides suffocating a few of them.

The ministry of the birds should also be invoked to keep down nsect pests by devouring eggs and grubs. The tom-tits and woodpeckers are of great service in this matter, and the bullfinches and chaffinches that devour so many buds, possibly also season their vegetable diet with a few caterpillars, grubs, and maggots at times.

But the best remedy against diseases and insect pests is superior cultivation. Establish and maintain apple trees in robust health, keep the stems free of parasites, including even the beautiful mistletoe bough where these abound. Leave no residuum of dirt or decomposition on trunk or branch to afford a foothold or breeding ground for vermin. Avoid overcropping, over or under feeding, and the chances are that the apple trees in garden or orchard will continue in good health, and yield full crops for a generation or more.

Determination of Varieties.

No one who has grown an extensive collection of apples but must have longed at times for some sure and certain method of determining different varieties. Apples, as everyone knows, differ greatly in form, size, character. Are these differences sufficiently constant to enable a careful observer to determine one apple from another? Various attempts have been made (chiefly by foreign pomologists or botanists) to seize upon certain characteristics of wood, habit, leaf, flower, or fruit, to form a basis for the determination of varieties.

Dr. Hogg (to whom British pomologists are already under great obligations) has recently advanced the most feasible theory on this subject. Taking the most constant and structurally important characteristics of the apple—such as the stamens, the calyx tube, the core cells, and the eye—Dr. Hogg shows that these features are sufficiently constant to form the basis of a useful classification for the determination of particular varieties. Of course, they are modified by seasons and circumstances, and it is seldom that each distinctive characteristic is found in the same degree of perfection. But in many cases one or two of the features being constant may suffice to determine varieties. The primary object of all classification is sure certification and—if this can

be assisted, or in many cases absolutely secured—perfect constancy of character is of less moment, and can hardly be looked for in a fruit so given to change as the apple.

Dr. Hogg bases his classification on a fourfold basis. The first is taken from the insertion of the stamens in the tube, the secondary from the tube itself, the tertiary from the cells of the core, and the subordinate from the eyes, form of the fruit, &c.

Of course there would be difficulties at first in using this or any other system of classification. It would also take considerable practice to become expert in the use of the signs employed to denote the different characters. But these once mastered, there can hardly be a doubt that Dr. Hogg's new classification of apples would prove of the greatest service in determining the different varieties, and would greatly facilitate a more intelligent knowledge of distinct sorts.

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